ELECTRONICS Australia

HiFi, Radio & Computers

APRIL 1979

AUST. $1.40* NZ $1.40

"HIFI" SPEAKER CABLES: A MYTH?

CAR BURGLAR ALARM, ELECTRONIC DICE

BONUS 100-PAGE LIFTOUT 1979 CATALOG

MARANTZ ROLLING THUNDER CAR STEREO

The CAR-420

THE FINEST NAME IN HOME STEREO NOW BECOMES THE FINEST NAME IN CAR STEREO

Marantz introduces a full line of DIN-size, in-dash component-quality AM/FM cassette units and under-dash power amplifiers, all with innovative new features. A complete selection of easy-to-install speakers ties together a truly competitively priced line.

Heading the four model line-up of AM/FM cassette units is the magnificent CAR-420 Compu Tuner (illus) coming complete with advanced Quartz control and microprocessor circuitry providing precise tuning with digital readout and electronic station search.

CONTACT YOUR MARANTZ DEALER FOR FURTHER SPECIFICATION INFORMATION AND MODEL AVAILABILITY.

THE "BOOM" IN ROLLING THUNDER

The Marantz SA-247 is an under-dash 60 watt RMS power amplifier with precise seven-band equalization and unique electronic matrix "Ambience" function.

The under-dash Marantz SA-230, with bass and treble controls, delivers 40 watts maximum RMS power.

THE CAR SPEAKER LINE WITH SOMETHING FOR EVERYBODY

Marantz offers eleven outstanding car speaker systems from the world's most advanced, the 5-way SS-569, to our basic four-inch full range SS-140. Many feature quick and easy through-panel installation, and every Marantz Car Speaker is designed with the special problems of auto installation in mind.

25th Anniversary marantz®

Distributed by: SUPERSCOPE (A'ASIA) PTY. LTD., P.O. BOX 604, BROOKVALE, N.S.W. 2100. Telephone: Sydney (02) 939 1900, Melbourne (03) 329 7655 • Adelaide (08) 336 2029 • Brisbane (07) 397 2066 • Perth (09) 328 3874 • Hobart (002) 44 4077.

GAC: SS001

ELECTRONICS Australia

VOL. 41 No. 1 APRIL, 1979

Australia's largest selling electronics & hi-fi magazine

Next month!

Watch out for our new easy-to-build 10-band stereo octave equaliser. Using just six high-performance economical ICs, the new Playmaster equaliser goes together easily in just a few hours with a minimum of wiring.

Dick Smith catalog

In case you haven't yet noticed, this issue carries a special bonus insert — a big 100-page **"Super Catalog"** *from Dick Smith Electronics. It includes not only products and prices, but data, information, circuits and ideas as well. You'll find it following page 56.*

On the cover

Our cover this month is an artist's conception of the Fairchild Channel F programmable video game and its broad range of entertainment possibilities. A full review of the unit was published in our December 1978 issue on p124. (Artwork courtesy Dick Smith Electronics).

FEATURES

HIFI TOPICS AND REVIEWS

PROJECTS AND CIRCUITS

AMATEUR RADIO, CB SCENE, DX

COLUMNS

DEPARTMENTS

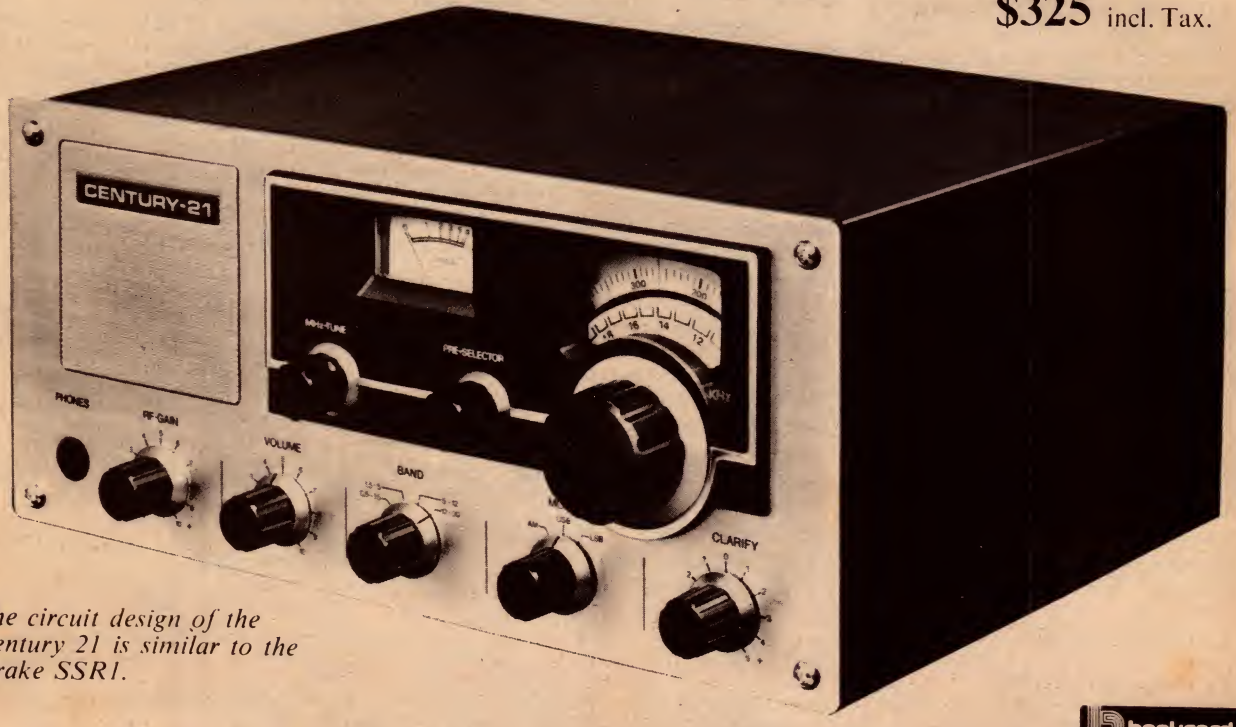
CENTURY-21
communications receiver

The CENTURY-21 Receiver provides precision tuning over the short wave spectrum of 0.5 to 30MHz with the capability of reception of AM (amplitude modulation), CW (continuous wave) and SSB (upper and lower single side band) signals.

The CENTURY-21 has a built in telescoping antenna or may be connected to an external antenna for better results. The sensitivity of the receiver is such that it operates near thermal limit and when using the telescoping antenna the performance reaches external noise limits.

Solid state circuitry is utilized throughout the receiver design allowing efficient operation or from an external DC or AC power source.

$325 incl. Tax.



The circuit design of the Century 21 is similar to the Drake SSR1.

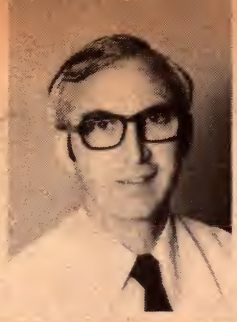
bankcard welcome here

ELMEASCO Instruments Pty. Ltd.

SYDNEY
PO Box 30, Concord, NSW 2137
13-15 McDonald St,
Mortlake, NSW, Ph (02) 736 2888.
Telex 25887

MELBOURNE
PO Box 107,
Mt Waverley, Vic 3149.
21-23 Anthony Drive, Mt Waverley, Vic
Ph (03) 233 4044

ADELAIDE
Phone (08) 51 3521
PERTH
Phone (09) 325 3144
BRISBANE
Phone (07) 229 3161



Editorial Viewpoint

Computers, satellites — who knows?

Many of the recent developments in electronics technology are posing magazines like ourselves with a growing dilemma. Some of these developments are so important and far-reaching for society as a whole that it seems irresponsible for us to restrict our coverage of them purely to the technical aspects. Yet at the same time the implications of these developments are so complex that it is becoming increasingly difficult for any one person — whatever their qualifications — to grasp them fully, let alone write about them with any semblance of authority.

What makes this dilemma all the more worrying is that the coverage of these developments in the non-technical or "popular" media is generally very superficial and unsatisfying. The result is that the vast majority of people are given no real help in understanding just what is going on.

I suspect what is also happening is that governments and statutory bodies are making profoundly important decisions regarding the future of these developments on the basis of advice from a very tiny number of supposed experts. There is no effective input from the community at large, simply because most of us feel too ignorant to offer an opinion.

An obvious example of this is computerisation, which I have tried to comment on in recent leaders. Another example, it seems to me, is the current question of a domestic communications satellite for Australia.

When the report of the interdepartmental "task force" set up to look into proposals for a satellite was tabled in Federal Parliament late last year by the Minister for Post and Telecommunications, the Government announced that it was deferring any decision on the report and leaving the matter open for "public debate" until December 31. The discussion period was later extended until March 31 this year, and will presumably have just ended by the time you read this.

What has happened? There has been virtually no "public debate" at all, merely sectional lobbying by a few organisations directly involved and by unions whose members could be adversely affected. A most worrying state of affairs, when one considers the tremendous importance of the satellite decision and its future implications.

I don't believe this lack of response is simply due to apathy. Surely it is more likely that most of us feel we just don't have sufficient insight into the complex questions involved, to comment. And by "us" I mean those of us in the technical media, just as much as the lay public.

Frankly it seems to me that where matters as complex and important as the satellite proposal are concerned, the Government has a duty to organise a national education campaign, to provide all interested citizens with sufficient knowledge to equip them for a sensible discussion. Otherwise it is simply intellectual dishonesty to talk about a "public debate".

— Jamieson Rowe

EDITOR-IN-CHIEF
Neville Williams
M.I.R.E.E. (Aust.) (VK2XV)

EDITOR
Jamieson Rowe
B.A. (Sydney), B.Sc (Technology, NSW)
M.I.R.E.E. (Aust.) (VK2ZLO/T)

ASSISTANT EDITOR
Philip Watson
A.M.I.R.E.E. (Aust.) (VK2ZPW)

SCIENCE FEATURES
Greg Swain, B.Sc. (Hons, Sydney)

PRODUCT REVIEWS
Leo Simpson

TECHNICAL PROJECTS
Ron deJong, B.E. (Hons, NSW), B.Sc.
Ian Pogson (VK2AZN/T)

GRAPHICS
Robert Flynn

PRODUCTION
Danny Hooper

ADVERTISING MANAGER
Selwyn Sayers

CIRCULATION MANAGER
Alan Parker

Registered for posting as a publication — Category B.
Printed by Magazine Printers Pty Ltd, of Regent Street, Sydney and Masterprint Pty Ltd of Dubbo, NSW, for Sungravure Pty Ltd, of Regent St, Sydney.

Editorial Office
57 Regent St, Sydney 2008.
Phone (02) 699 3622
Postal Address: PO Box 163, Beaconsfield 2014.

Advertising Offices
Sydney — 57 Regent St, Sydney 2008.
Phone (02) 699 3622
Representative: Narcisco Pimental.

Melbourne — 392 Little Collins St, Melbourne 3000. Phone (03) 602 3033
Representative: Keith Watts

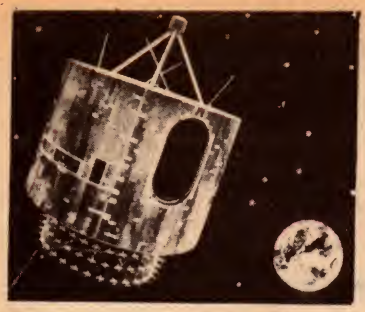
Adelaide — Charles F. Brown & Associates Ltd, 254 Melbourne St, North Adelaide 5006
Representative: Tom Duffy, (08) 267 4433.
Perth — 454 Murray Street, Perth 6000
Representative: Ashley Croft, (09) 21 8217.

Subscriptions
Subscription Dept, John Fairfax & Sons Ltd, GPO Box 506, Sydney 2001.
Enquiries: Phone (02) 20944, ext 2589.

Circulation Office
21 Morley Ave, Rosebery, Sydney 2018
Phone (02) 663 3911.

Distribution
Distributed in NSW by Sungravure Pty Ltd, 57 Regent St, Sydney; in Victoria by Sungravure Pty Ltd, 392 Little Collins Street, Melbourne; in South Australia by Sungravure Pty Ltd, 101-105 Weymouth St, Adelaide; in Western Australia by Sungravure Pty Ltd, 454 Murray Street, Perth; in Queensland by Gordon and Gotch (A'asia) Ltd; in Tasmania by Ingle Distributors, 93 Macquarie St, Hobart; in New Zealand by Gordon and Gotch (NZ) Ltd, Adelaide Rd, Wellington.

Copyright. All rights reserved
Devices or arrangements shown or described herein may embody patents. Information is furnished without responsibility for its use and without prejudice for patent rights. All manuscripts, photographs and other material submitted to Electronics Australia for publication must be accompanied by a stamped, addressed envelope. Contributions are submitted at the sender's risk, and responsibility for loss cannot be accepted by Electronics Australia.
*Recommended and maximum price only.



News Highlights

Australian team develops "bionic ear"

. . . deaf man hears sounds!

An Australian bio-engineering team has developed a "bionic ear". The device, which could benefit Australia's 10,000 and the world's four million profoundly or totally deaf, would sell on the commercial market for about $5000.

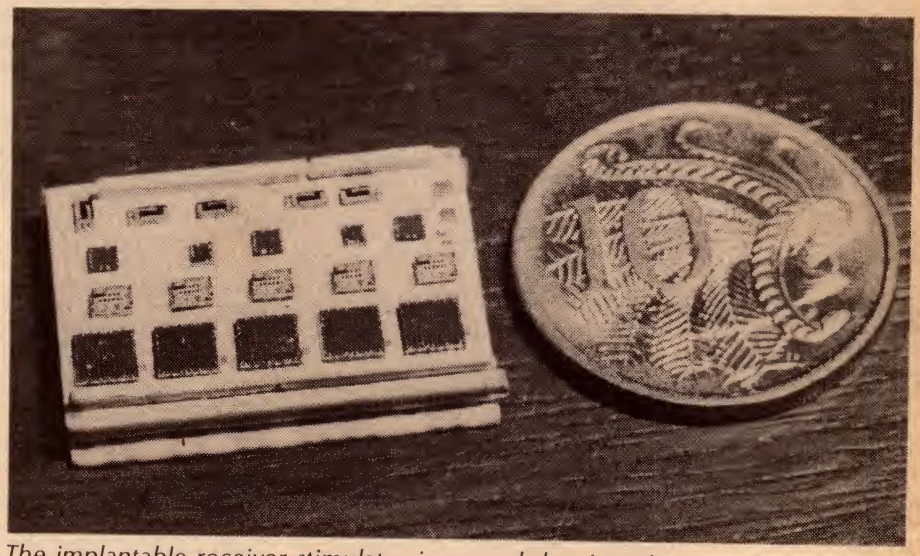
Work on the bionic ear has been carried out over the past eight years by Professor G. M. Clark, working with a team of graduate bio-engineers. The Defence Research Centre (formerly the Weapons Research Establishment) and Telecom Australia laboratories provided considerable assistance in developing the necessary technology.

A Melbourne man who lost his hearing as a result of head injuries received in a traffic accident in January 1977 became the first patient to test the device when doctors implanted the "gold box" electronic ear in his mastoid bone last August. Since then, the research team has determined that Mr Rod Saunders, 48, of Dandenong, can perceive at least six vowel sounds. This could improve as he learns to "interpret" the electronic impulses.

The "bionic ear" is based on the principle of electronically receiving, processing and coding sounds in a similar manner to that which occurs naturally in the nerve fibres of people with normal hearing. The coded information is converted to electric impulses which are fed along small wires to the inner ear where the nerve fibres are stimulated electrically to enable the nerve-deaf person to "hear".

A processor-transmitter, worn externally, receives and processes sound vibrations and transmits the coded information through the skin in the form of radio signals to an implanted receiver-stimulator.

The receiver-stimulator, implanted in the mastoid bone behind the ear, receives and decodes the signals and converts them to electrical impulses which pass through a connector to an electrode bundle in the inner ear. This bundle consists of an ultra-miniature array of 10-15 electrodes which contact directly with the auditory nerve endings.



The implantable receiver-stimulator is around the size of a 10 cent piece.

The "gold box" receiver-stimulator contains no power source so that, once implanted, it is there permanently. Instead, the power source is housed in the "silver box" processor-transmitter. This device will eventually be reduced to a pocket-sized unit, with wires leading up to the transmitter worn externally, but close to the implant. The transmitter could probably be built into the frame of a pair of glasses in a similar fashion to some conventional hearing aids.

A statement issued in Canberra recently by the Minister for Productivity, Mr Macphee, placed great emphasis on commercial development of the device, suggesting that the overseas market could provide "important economic benefits". A Government grant of $400,000 has been made for the first part of a two-phase development program.

Australian development is said to be substantially more advanced both medically and technologically than similar developments in Europe and the United States.

Canada expands satellite system

Canada's ninth satellite, Anik-B, blasted into orbit last December as part of a $36 million program to test a variety of promising new social uses for satellite communications.

One of the most promising new applications is likely to be direct satellite-to-home television broadcasting. The Canadian Government plans to conduct trials on a variety of small satellite ground stations produced by Canadian industry.

GE to develop hybrid car

A preliminary design of an experimental "hybrid" automobile powered by both a petroleum-fueled engine and an electric motor will be produced by the General Electric Research and Development Center and a team of consultants under a US Department of Energy contract.

Under the terms of the year-long, $350,000 contract, GE will design a vehicle that will have maximum potential for reducing US petroleum consumption. The vehicle will run part of the time on gasoline or diesel fuel, part of the time on batteries, or on both simultaneously.

GE is one of four contractors proceeding in parallel for the first phase of the DOE's "Near-Term Hybrid Vehicle Program". A major part of GE's effort will be aimed at determining the optimum size, configuration, and operating conditions for a hybrid power plant. Early engineering studies indicate that a hybrid vehicle would burn less fuel than a petrol-powered car, and would have greater range and power than an all-electric vehicle.

Satellite ground station

Supplied by the Plessey Company, this 5-metre receiving antenna was recently used to test the feasibility of providing live television to remote areas of Australia via the Pacific Intelsat satellite. The antenna and other componets of the ground station were manufactured by Scientific Atlanta Inc, USA.

Standards near for PCM disc?

Mindful of the lack of standardisation in videocassette recorders, 29 Japanese, American and European firms have formed an informal organisation to establish voluntary standards for a digital audio disc system. Philips, Matsushita, JVC, RCA and others have already developed pulse code modulation (PCM) systems based on their videodisc developments, but none of the systems developed so far is compatible with any other.

The new organisation, known as "Digital Audio Disc Standardisation Conference", will attempt to reconcile differences in recording methods, record size and rotation speed of the various proposed systems, and to develop standard sampling rates, encoding, decoding and error correction systems. The group will also explore the possibility of compatibility with videodisc systems.

Fuzzbuster goes to court

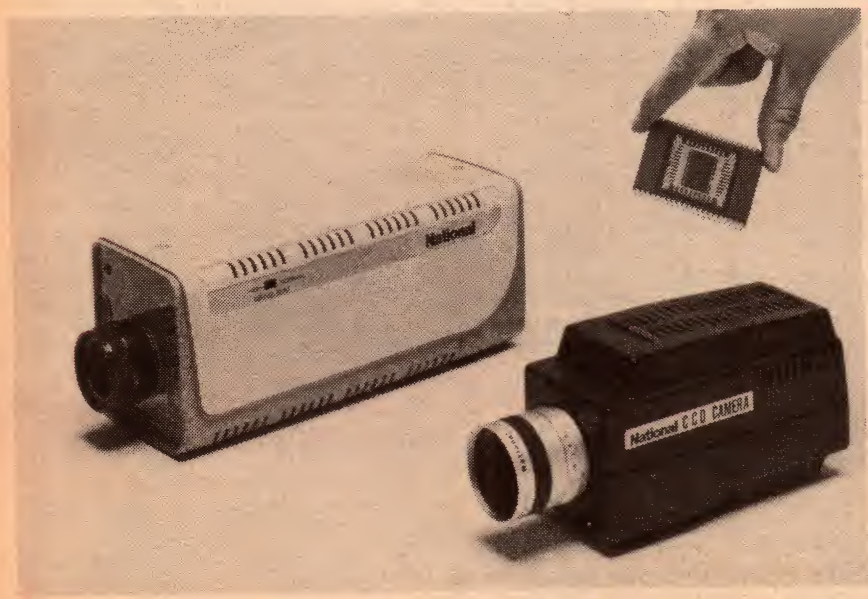
Electrolert Incorporated (USA), manufacturer of the Fuzzbuster radar detector, has instituted legal proceedings against what the company terms "libelous and defamatory" statements made by several organisations about the device.

Among the defendants is the Pennsylvannia Turnpike Commission, which operates that state's toll roads. Apparently, the commission has been handing out leaflets to motorists, stating that the Pennsylvannia State Police radar is immune to the Fuzzbuster (and other radar detectors). Another target for legal action is the Better Business Bureau of Miami, accused of distributing a letter to newspapers and radio and TV stations in southern Florida, asking that they refuse advertising for Fuzzbusters.

End to metal glaze resistor production

Australia's only metal glaze resistor manufacturer, IRH Industries, a division of Natronics, expects to cease production in that area by June this year. The managing director of IRH and Natronics, Mr Bruce Hume, said that the decision to stop production had been reached after examining a loss situation that had existed in IRH for the last two years.

Electronics manufacturers will now have to look to countries such as Korea, Taiwan, Singapore and Japan for resistor supplies. The market in Australia has a volume estimated at between 150 million and 200 million units a year.



Matsushita CCD camera (right) compared with a conventional tube camera.

Solid-state CCD camera

Matsushita Electronics Corporation, Japan, has begun delivery of a high resolution, monochrome, solid-state video camera employing a charge coupled device, the first to be released by a Japanese company.

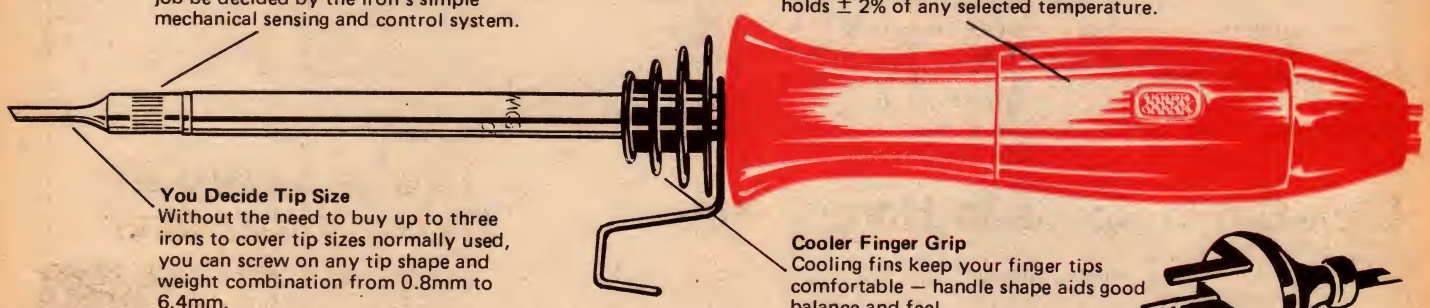
The charge coupled device (CCD) used was developed by the company last September, and replaced the image pick-up tube used in a conventional camera. It provides the camera with a resolution of 350 vertical lines and 360 horizontal lines, the CCD itself having some 248,832 picture elements (512V x 486H).

Main advantages of the CCD camera include compact size, light weight, low power consumption, reliability, and no image distortion.

A professional iron with adjustable temperature–wattage and tip size...

Automatic Wattage Selection
Let the actual wattage required for the job be decided by the iron's simple mechanical sensing and control system.

Automatic Temperature Control
Dial any intermediate temperature 200°–400°C without changing the tip; holds ± 2% of any selected temperature.



You Decide Tip Size
Without the need to buy up to three irons to cover tip sizes normally used, you can screw on any tip shape and weight combination from 0.8mm to 6.4mm.

Cooler Finger Grip
Cooling fins keep your finger tips comfortable — handle shape aids good balance and feel.

240V Mains Operated

Have you experienced the frustration of starting to use your 15 watt iron only to realize the tip is going cold before the solder flows — alternatives?

(a) Wait 5–10 minutes to heat up your 30 watt (even though the tip on it is really too big). (b) Be a supreme optimist and hope your 15 watt will eventually heat up the joint before you cook the component and lift the track. (c) Switch on your SCOPE TC60 and while waiting the 45 seconds to heat — screw on the tip size you really want.

The SCOPE TC60 will decide the wattage required for each joint.

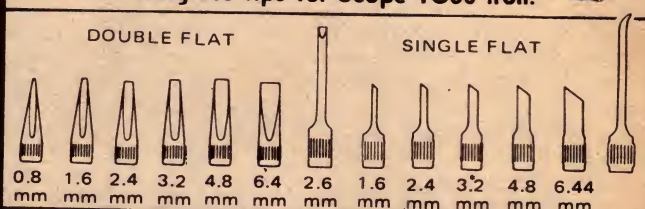
Some other SCOPE TC60 features –

- **Component Protection** is aided by earthed tip and barrel. Critical components and operator can then be earthed to common point.
- **Simplicity** of temperature control system suggests less maintenance. An expanding metal probe detects temperature variations inside each tip and operates a mini micro switch in the handle.
- **Temperature Key** is inserted into handle. 40°C variations per quarter turn. Key is removable to discourage unwanted alteration to temperature setting.
- **Neon** indicates when power is being applied to elements — monitors control system.

50V, 24V Versions are available with 50W element.

SOLDERING–DESOLDERING STATION

Long life tips for Scope TC60 iron.



Iron plated screw-on pre tinned. *This tip is fitted as standard.

SCOPE TC60

The iron you completely adjust to your job.

FOR YOUR NEAREST STOCKIST RING:

MELBOURNE VIC. (03) 338 1566
SYDNEY N.S.W. (02) 818 1166
ADELAIDE S.A. (08) 212 3111
BRISBANE QLD. (07) 221 1933
TOWNSVILLE QLD. (077) 71 3448
ROCKHAMPTON QLD. (079) 27 3370
HOBART TAS. (002) 34 2811
LAUNCESTON TAS. (003) 31 5545
PERTH W.A. (09) 381 4155
AUCKLAND N.Z. 54 6029
WELLINGTON N.Z. 85 9578

New concept in power distribution

A four-year study of a new concept in power delivery — chemical pipelines that could deliver heat at high efficiency from nuclear, coal, and solar plants directly to homes and industry — has been completed at the General Electric Research and Development Center, Schenectady, New York.

Funded in part by a contract from the US Department of Energy (DOE), GE scientists have investigated the potential of the "chemical heat pipe" — an advanced concept that could deliver heat energy over long distances at more than twice the efficiency of conventional methods.

The chemical heat pipe is made up of two chemical reactors separated by a pair of pipelines that may be 160km or more in length. The "input" end of the chemical heat pipe is hooked to a heat source, while the "output" end is located where the heat is needed.

At the input end, a special mixture of liquids or gases absorbs heat and, with the help of a chemical catalyst, undergoes a change in the chemical reactor. Essentially, the gases or liquids are converted into a new chemical combination, with the heat energy "locked up" in their molecular structure.

The high-energy mixture is then pumped to the other end of the pipeline, where it undergoes the reverse chemical change in the other chemical reactor, returning the liquids or gases to their original low-energy form and releasing the heat energy they carried. During the conversion process, no pollution is generated to affect the local environment.

The original mixture of gases or liquids is then pumped back to the heat source in a return pipe to begin the process all over again.

One advantage of a chemical heat pipe is that it absorbs and releases heat with very little energy loss from one end of the pipeline to the other. For example, about 80 per cent of the thermal energy put into a 160km long pipeline would be released at the far end.

Dick Smith opens in Hong Kong

Sydney electronics entrepreneur Dick Smith has opened a duty free store in Hong Kong. This store, the 18th in the Dick Smith Electronics Group, is the Group's first overseas venture. Over $500,000 was invested to get it off the ground.

"There are more bargains in Hong Kong than any other place on Earth," Dick Smith claims. "However, after-sales service can be a real problem. I've been thinking for some time now that a shop in Hong Kong that was still cheap, but had guaranteed after-sales service here in Australia, would be a real goer."

Goods on display in the Hong Kong store will be clearly pricemarked, and the prices will be as good on average as prices from other reputable stores — but without the hassle of bargaining. The store will be run by Australians, with some local help. The address: Dick Smith Electronics (Hong Kong) Ltd, Ground Floor, Kowloon Centre Bldg, 29-39 Ashley Rd, Kowloon, Hong Kong.

Design award for Aust. transceiver

A Western Australian company, RF Systems Pty Ltd, has won an Australian Design Award for its recently developed Kimberley 102 mobile transceiver.

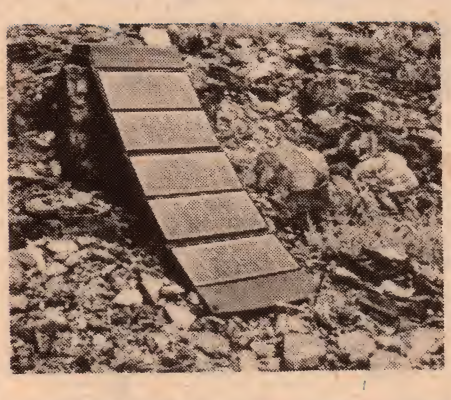
The main feature of the 102's design is the provision for a variety of options to meet special requirements. These include repeater and link operation, selective calling for mobiles and base stations, multi-channel operation, and a remote control head. The control head fits in the dashboard and enables the transceiver to be located in the boot of the vehicle.

RF Systems says that in addition to the WA market the company is also supplying transceivers to the Eastern States, and to South Africa, Kenya and South East Asia. The company's address is 98 Gutherie St, Osborne Park, Western Australia 6017.

Military solar panel contract

Philips Electronic Components and Materials has been awarded a contract by the Department of Administrative Services to develop a rugged, lightweight photovoltaic solar module for evaluation by the Department of Defence. Development work will be undertaken by specialist solar cell engineers at the Philips Semiconductor Development and Production Facility, Hendon, South Australia.

Design objectives of the contract require high electrical efficiency to be achieved under operational conditions, combined with an impact resistant, but lightweight encapsulation suitable for inclusion in a standard service kit.



Vicom appointment

Vicom International Pty Ltd has appointed Mr Max Pietruschka to head up its expanding Professional Products Division. The Division handles high quality specialist communications and security equipment, together with a wide range of test instrumentation for defence and other government agencies.

SHADOWS OF THE PAST

Movie cameras have been capturing life in Australia for more than 80 years now, producing an invaluable record for posterity. The responsibility for preserving this record rests with the National Film Archive in Canberra. EA's editor, Jim Rowe recently spent an interesting day touring the Archive, and here is what he learned:

In September 1896, the pioneering French cinematographer Maurice Sestier landed in Sydney and began filming with some early equipment made by the Lumiere brothers. In the more than 80 years that have passed since then, movie cameras of one sort or another have been grinding away almost continuously in Australia, capturing an irreplaceable record of our lives and dreams.

Newsreel cameras have been recording our public events and catastrophies; documentary cameras have been recording our habits, ceremonies and industries; and during at least some of the 80 years, other cameras have been filming dramas and comedies which capture some of our hopes, fears and aspirations. All told, a lot of Australia's recent history has been captured on film.

The job of ensuring that as much as possible of this heritage is preserved for future generations falls on the National Film Archive, in Canberra. The NFA is part of the Film Section of the National Library of Australia, the Film Section being in turn part of the National Library's Humanities Library, or ANHUL (like the Music and Sound Recordings Section, which I wrote about in the April 1977 issue).

Head of the National Film Archive is Ray Edmondson, the Director of the NLA's Film Section — which also includes a non-theatrical film lending library. Directly responsible for the Archive is Chief Film Officer Karen Foley, and under Karen is a small but enthusiastic group of people dedicated to the job of finding and preserving Australia's film history.

A few weeks ago I was invited by Ray Edmondson to visit the Archive, with the idea of learning more about it and meeting the people involved. I didn't have to have my arm twisted, having a strong personal interest in movie history! Consequently it wasn't long before I spent a very interesting and enjoyable day at the Archive, talking with Ray, Karen and their colleagues.

I was surprised to learn from Ray that the Archive actually dates from 1937, when it was set up following a Cabinet resolution. However, the second World War intervened before the fledgling archive really got under way. It was not until the mid-1950s that the work of tracking down and preserving Australia's film history really began, by which time the Archive had become a responsibility of the Film division of the National Library.

During the 1950s and 1960s the Film Section's staff was only able to carry out archive work as a secondary or "background" activity — when time and the pressure of work in the lending library permitted. Despite this and the relatively late start made, a surprising number of early films were discovered and saved for preservation — including Raymond Longford's classic 1919 version of C. J. Dennis's "The Sentimental Bloke".

By 1973 the Archive's collections had become so large that it became the responsibility of a separate staff unit. For the first time, the Archive had its own staff members who were finally able to give it their full attention. The scope of its activities could be broadened, and more effort directed to tracking down and preserving surviving films and memorabilia.

In the six years since 1973 the Archive collections have been increasing in size by about 30 per cent each year. Karen Foley tells me that there are now just on 23,000 titles in the film collections, including some 5800 cans of inflammable cellulose nitrate film. As yet only about a third of this nitrate film has been copied onto safety film for long-term preservation, an enormous task which will take many years.

The Archive has approximately 6900 black and white films stored as long-term "preservation copies" on safety film, along with approximately 690 colour films in the same form. There are also some 3900 titles available for viewing, on the premises or externally subject to copyright restrictions.

Preservation copies themselves never leave the Archive except for copying. They are never projected, and are only viewed on rotating-prism viewers which treat the film much more gently than does a projector. A strict record is kept of every occasion that a preservation copy is viewed, copied or otherwise handled. When it has been viewed or copied a small number of times it becomes restricted for copying

use only, and a duplicate made for viewing.

In addition to conventional films the Archive currently has around 300 titles of videotape, mainly TV productions. As yet the Archive's videotape facilities are very limited, but this is being corrected in view of the likelihood that videotape will be used to an increasing extent in the future.

Because the Archive staff is still quite small, some 12,000 titles in its collection are still waiting to be "accessioned". This means that they are stored, but are waiting for Archive staff to get a chance to inspect them properly, record all their details and arrange for the appropriate preservation records.

Apart from films, the Archive also has pictures and other material.

One of the services provided by the Archive is a footage service for film and TV producers. For a "costs only" fee the Archive supplies historic and other rare footage to the producers, after clearance has been obtained from the copyright owners. This service is now used very frequently. The recent production "Newsfront" made very extensive use of footage supplied by the Archive, marrying this material very successfully with newly-taken footage.

Also provided by the Archive is a viewing service for research purposes. Private individuals who are carrying out bona fide research may view copies of Archive films, free of charge but subject to staff availability, the accessibility of viewing machines and any requirements regarding preservation.

The Archive also operates a storage and deposit service for Australian film producers. The producers' original negatives or masters are accepted for preservation and storage, on a donation or "deposit" basis. The owner's copyright control of the material is assured, and it is readily available for his or her further use if required. At the same time it is protected from loss, and placed within the Archive's preservation system.

Incidentally the Archive is the only Australian full member of FIAF, the International Federation of Film Archives, which has members in 40 countries. FIAF ensures the maintenance of preservation and operational standards among its member archives, provides the means for free exchange of films and documentation, and organises international commissions which research and develop aspects of film archive work. It also arranges training courses for archivists, and both Ray Edmondson and Karen Foley have attended such courses.

Of course the main function of the National Film Archive is to ensure the survival of as much as possible of Australia's film heritage, in the best possible condition. This involves a number of aspects, not the least of which is the problem of getting hold of the films in the first place.

Australia had quite a prolific film industry in the early silent film days, before it was swamped by Hollywood. Even in the later silent period a surprising number of films were produced, including many which were very well received. However, only a relatively small number of the Australian films

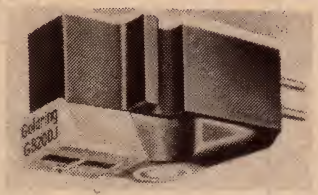
The still above is from Franklyn Barrett's "The Breaking of the Drought" (1920), with Rawdon Blandford at far left, Trilby Clark in a faint, and Dunstan Webb accusing. At right is a still from the 1921 film "Silks and Saddles", with John Faulkner, Robert MacKinnon and Brownie Vernon. (NLA stills)

a collection of film stills, posters and other related items. It has currently about 180,000 stills from overseas titles and 5,000 stills from Australian titles, all of which are accessible by either film title or personality. There are also approximately 15,000 overseas posters, as yet unaccessioned, together with about 1000 Australian posters indexed by film title.

The use of the Archive's collections and facilities has grown rapidly in recent years, also. The Archive is now the central source of film and television information in Australia, and handles more than 40 major enquiries per month. This includes research projects and requests from authors regarding

Good DJs won't tolerate drop-outs

That's why they insist on the British Goldring G 820 DJ Cartridge — specially designed for disco and professional use.



Its reinforced stylus, with a naked point encapsulated in a steel sleeve, just won't drop out when you least want it to.

Its built in durability will withstand endless punishment, backtracking and cueing without you getting frayed round the edges.

But for all that, the British Goldring 820 DJ cartridge tracks with a featherlight touch to give you the authentic British Goldring sound. Real sound, faithful sound.

The British Goldring 820 DJ — it's like music to the ears.

GOLDRING PRODUCTS LIMITED, ENGLAND

FOR FURTHER DETAILS RING:

AUSTRALIAN DISTRIBUTORS FOR GOLDRING PRODUCTS LTD, U.K.

SOUNDRING DISTRIBUTORS

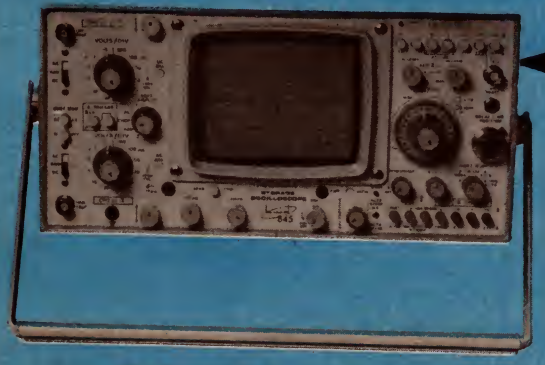
1/514 Miller St., Cammeray 2062.
Tel. (02) 92 1990

AGENTS:

VIC.: Jasper Coote Pty Ltd, 304 Coventry St., Sth Melbourne, 3205. Tel. (03) 699 4455.

QLD: Green Brothges Pty Ltd, 83 West St., Rockhamptom. Tel. 27 3047.
467 Flinders St., Townsville, Tel. 72 1544.

Two *outstanding* oscilloscopes



30 MHz Storage.

Field Portable AC - DC or Battery powered.

100 MHz with video line selector option.

The BWD 845 dual trace variable persistence STORAGE oscilloscope has 5 div./μSec. storage writing speed, auto store and auto view. Bandwidth is 30MHz and Sensitivity 1mV/div.

BWD 540 dual trace - dual sweep DC to 100MHz - 3db with 5mV sensitivity and 5nSec. sweep speed.
BWD 701 Video Line Selector adds precision video monitoring with sensitivity from 25mV to >100V and a flat response to 10MHz.

BWD
ELECTRONICS PTY. LTD.
Miles Street, Mulgrave, Victoria. 3170
P.O. Box 325, Springvale, 3171
Telephone 561 2888. Telex 35115

N.S.W.	Amalgamated Wireless (A'asia) Ltd., Sydney. Ph. 888 8111
QLD.	Warburton Franki (Brisbane) Pty. Ltd., Phone 52 7255
S.A.	Protronics Pty. Ltd., Adelaide. Phone 212 3111
	Rogers Electronics, Adelaide. Phone 42 6666
W.A.	Cairns Instrument Services, Perth. Phone 325 3144
TAS.	Associated Agencies Pty. Ltd., Hobart. Phone 23 1843

FC101 A

SHADOWS OF THE PAST

At left, Chief Film Officer Karen Foley examines a film on an Intercine viewing machine. Above, Technical Officer Keith Pardy checks a preservation copy. (Pictures by Henk Brusse, NLA photographer).

produced before 1929 are definitely known to survive, and not all of these have found their way into the Archive for proper preservation.

Ray Edmondson thinks it possible that almost as many films again may still survive, in the hands of private film collectors. But private collectors are generally rather shy about their collections, because of the fear that production companies or distributors may be able to seize the films under copyright law.

This fear is not without justification, because in the past producers and distributors have sometimes displayed very little concern for film preservation — being prepared to destroy old films rather than risk any possible copyright infringement. And the films held by private collectors are sometimes clandestine prints, which should have been destroyed for copyright protection after reaching the end of their official working life.

Ironically the very fact that prints do sometimes escape destruction and fall into the hands of private collectors has resulted in the lucky survival of quite a few important films. The master negatives and printing copies have been lost, due to fires or the flooding of studio vaults, and the only surviving copies have been found as clandestine prints in the possession of private collectors. At times even the producers themselves have been grateful for this clandestine preservation route, as they have been able to re-release the films concerned and derive further revenue.

Despite this, producers and distributors are still very sensitive about copyright, and private collectors are understandably reticent about revealing their secret treasures — let alone being prepared to loan, give or sell them to the National Film Archive for preservation.

Yet time is running out, for early silent films in particular. The cellulose nitrate film stock used for most silent films is chemically unstable, and has a relatively short life: typically only about 50 years under relatively favourable conditions. As few private collectors are able to store it under such conditions, this means that any of the early silent films that still survive may be very close to the end of their useful life. Needless to say, the Archive is far better equipped to preserve and copy such films than private collectors.

In order to encourage private collectors to assist the Archive in its aims, Ray Edmondson and Karen Foley have established the Archive as a copyright "neutral territory". Collectors are assured that all dealings between themselves and the Archive remain strictly confidential, unless the collector gives permission for information to be released. If this is not done the Archive does not disclose the source of its acquisitions to producers, distributors or anyone else.

This policy has indeed resulted in a number of collectors making themselves known to the Archive, and enabling it to acquire copies of quite valuable and rare films. An essential section of the 1920 silent version of Rolf Boldrewood's "Robbery Under Arms" was provided by one collector, while another loaned the Archive a rare print of a short film showing Mary Pickford receiving a presentation from Australian admirers in Hollywood, in 1914.

Apart from collectors, the main source of historic Australian films seems to be the accidental discovery of caches when buildings such as homes or old theatres either change owners or are demolished. An important discovery of this sort happened in 1976, when a print of Franklyn Barrett's famous 1920 silent melodrama "The Breaking of the Drought" was found under a house in Hornsby, NSW.

Not long before that, a cache of some 120 cans of film was found in an old garden shed at Macquarie Fields, also in NSW. Many of the reels were too badly decomposed to be salvaged, but among those saved were a film starring

VIDEO TECHNICS

THE CAROUSEL CENTER, SHOP 17 & 18, 530 OXFORD ST., BONDI JUNCTION
P.O. BOX 50, BONDI ROAD, BONDI 2026, NSW 2022. TEL.: 387 2555.
3RD FLOOR, EQUITABLE LIFE BUILDING, 301 CORONATION DRIVE, BRISBANE 4064. PH. 36 1257

3 HOURS VCR VIEWING

3 hours continuous recording/playback. 1-2-3 operation simplicity. Video head and azimuth recording system: key to perfect picture reproduction. The ingenious yet simple "M" loading system, low 35 watts power consumption.
Units available — Sony, Philips, National, etc.

VIDEO MOVIES

FULL LENGTH FEATURES — MANY TITLES AVAILABLE AUSTRALIA WIDE

These movies suitable for all video players including Betamax and VHS

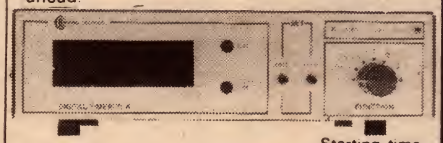
Movies available in all classifications from G to R rating.
We require dealers and franchises in all states.

VIDEO EQUIPMENT —

Sony, Akai and JVC Colour and BW Portopacks. We have several BW Portopacks traded on colour sets. Also agents for JVC, National, Sony and Nec Umatic equipment. All formats and brands colour and BW recorders, editors, generators and blank video tapes available. New and used equipment. Trade and terms.
Specials. Also transfers from Super 8 film to video tape.

SPECIAL CLOCK TIMERS

Can be set to switch equipment up to 4 days ahead.



Starting time accurate to a second

$195 + P.P.

FRANCHISEES REQUIRED FOR S.A., W.A., VICTORIA AND TASMANIA

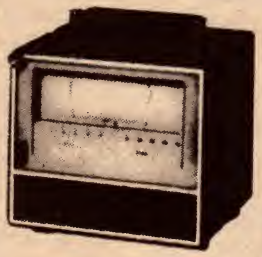
rustrak

PRESENTS YOU WITH

twins

NEW RUSTRAK '300' DUAL WIDTH MINIATURE RECORDERS

double the data at your fingertips... combine in one housing two standard Series 200 recorders on a common time base . . . using a single chart. Provide greater flexibility in charting many functions including current, voltage, temperature, pressure, events. Inkless rectilinear recording. Choice of writing speeds. Charts, accessible from the front for easy notation, operate tear-off or reroll. Accuracy ± 2%.



Model shown: 3162/3144 Gas or Liquid Pressure and Temperature Recorder.

TECNICO ELECTRONICS

Premier Street, Marrickville, N.S.W. 2204. Tel. 55 0411
2 High Street, Northcote, Vic. 3070. Tel. 489 9322

RTW/178

SHADOWS OF THE PAST

Louise Lovely, an Australian girl who made good in Hollywood in the silent movie days and who now lives in Hobart. Also found was a rare film made in 1914 by Lois Weber, one of the world's first women producers — "The Hypocrites". The Archive sent a copy of this film to the American Film Institute in Washington, who were most grateful as the film had been feared lost.

Once a film actually reaches the Archive, the next step is for it to be carefully examined by an experienced archivist such as Karen Foley or Kate McLoughlin, the Archive's Film Reference Officer. All relevant and available information on the film is recorded systematically — not just the title and production details, but also detailed technical information on the current condition of the print (or negative).

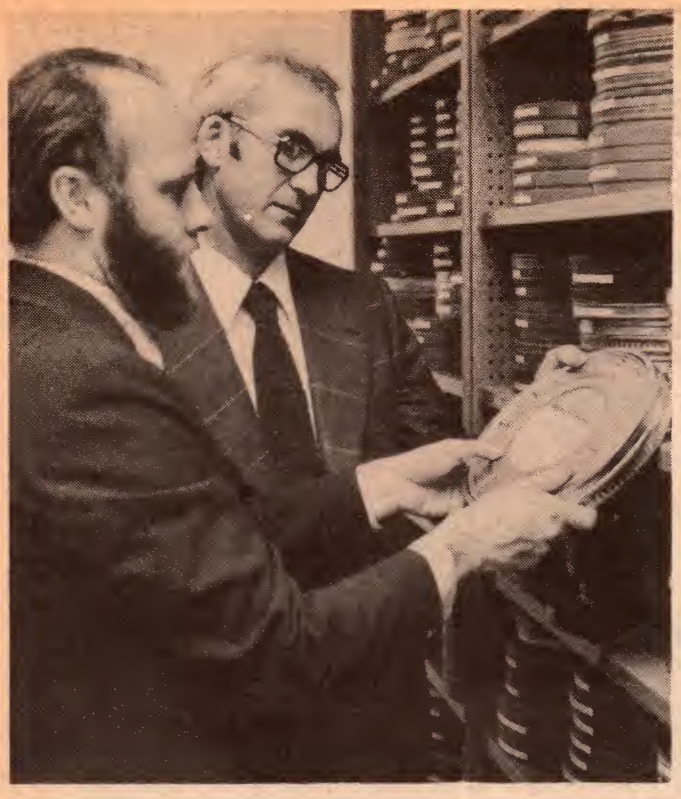
In many cases a film requires extensive repair work before it can be either viewed or sent for copying. This work is done by Technical Officer Keith Pardy, who is very experienced in film reconstruction. Some of Keith's achievements have been the reconstruction of "The Breaking of the Drought", "Robbery Under Arms", and before these the 1921 Australian film "Silks and Saddles". The last of these came to the Archive as the original negative, but had the scenes in tinting and toning sequence rather than in story line order. It had to be reassembled in story line order, as well as needing the addition of missing subtitles.

One of the NFA's most interesting jobs in recent years has been the restoration of Charles Chauvel's last feature, "Jedda", made in 1955. This was filmed in early Gevacolor, which proved to be unstable; within a few years of its first release both the prints and original negative had faded so much that colour reproduction was no longer possible.

Then in 1972, Mrs Elsa Chauvel discovered a set of black and white colour-separation prints of the film in a laboratory vault in England. She approached the Archive, which undertook to reconstruct the original colour version from the separations.

When the Archive began the job they found that the separations had shrunk, which made colour registration a problem. Not only that but the separations were for a version of the film which differed in both length and cutting detail from the final release version. This meant that in places they did not match the continuity of the surviving sound track.

The problems were overcome, however, and the restored colour version of "Jedda" has recently been shown to great acclaim. Most who saw the original film agree that the restora-



Above: Ray Edmondson, Director of the National Library's Film Section, and EA Editor Jim Rowe in the Archive's acetate vault. Right: Archive Reference Officer Kate McLoughlin selecting a still from the collection. (Pictures by Henk Brusse, NLA).

tion is, if anything, even better than the original. It certainly reveals why "Jedda" was regarded as an outstanding example of Chauvel's romantic vision.

When films are being repaired or reconstructed they are copied onto cellulose tri-acetate "safety" film, for preservation. At present the copying and printing work is not done at the Archive itself, but is sent to commercial laboratories. However, most of the work involves black and white film, and relatively specialised techniques. The number of commercial laboratories equipped to handle black and white film is now quite small, and becoming smaller all the time. Before long it may be necessary for the Archive to set up its own laboratory.

It is the triacetate copies of films which become the preservation copies, to be stored in the Archive's vaults. Here they are stored in conditions which approach the optimum for acetate film, which are a temperature maintained between 10 and 12°C, and a relative humidity maintained between 50 and 60 per cent. Under these conditions the estimated life of triacetate film is up to 400 years — much longer than the life of the older nitrate stock.

Although the ultimate aim is to store all of the Archive's film collection in triacetate form, the job of copying all of the nitrate films onto safety film is very expensive and will take many years. The Archive must therefore store a considerable amount of film in nitrate form, and will need to do so for some time.

Because it is a potential health and fire risk, the nitrate film cannot be stored like the safety film in the main National Library building. At present it is stored temporarily in a building at the munitions factory at St Marys, NSW. However, a new complex of fire proof film vaults is currently being built in Canberra, not far from the main Library building. When the new complex is completed the nitrate film will be moved there, and stored at very close to the optimum conditions for that type of film: a temperature between 0 and 4°C, with relative humidity maintained at a stable value between 40 and 60 per cent.

Actually nitrate film in particular cannot be simply stored indefinitely, even if it is in good initial condition and stored in optimum conditions. Because of its chemical instability it generates corrosive gases, even before obvious decomposition takes place. It must therefore be rewound regularly, to release the trapped gases, and also frequently inspected to detect the onset of decomposition.

This draws attention to what is perhaps in many ways the most important aspect of film preservation: the need to have well-planned and tightly controlled organisational methods. As Ray Edmondson and Karen Foley both stress, there isn't much point in having all sorts of fancy preservation equipment and expensive film vaults, if you don't have properly organised procedures for ensuring that all films are fully controlled and identified in all phases of handling and storage.

Needless to say this aspect of the National Film Archive's operation has been very carefully planned. The systems used have been evolved from those in use at many of the established overseas archives, and represent the latest thinking in terms of film archive "good housekeeping".

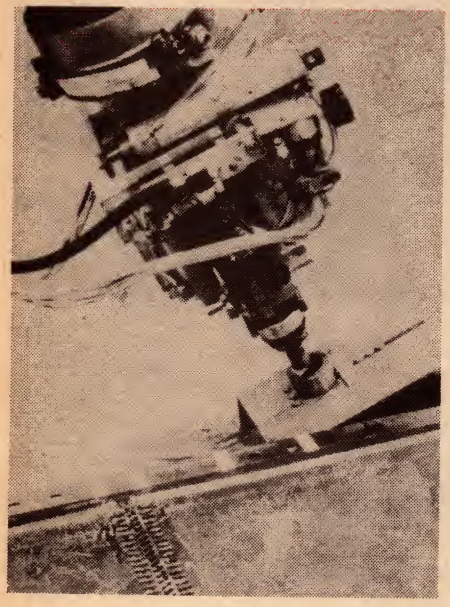
During my tour of the Archive I was most impressed, not only by the methodical way it is run, but also by the obvious enthusiasm and dedication of its staff. I think we can all be grateful that we have Ray Edmondson, Karen Foley, Keith Pardy and their colleagues in Canberra, doing such a great job of preserving Australia's films.

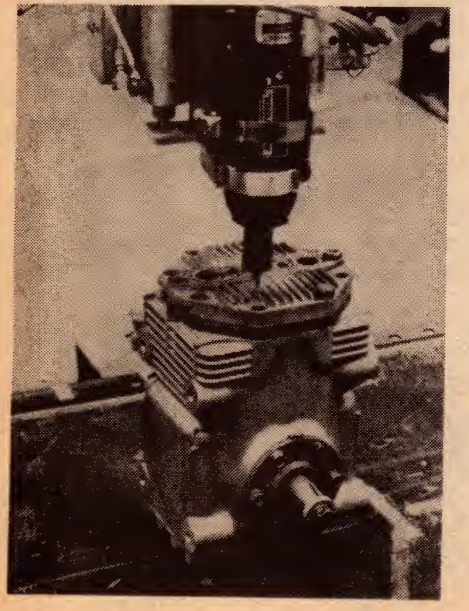
Finally, a request. If you happen to be one of those shy, private film collectors with some old films which could be of interest to the Archive, why not drop them a line? Any information you give can be strictly confidential, and who knows — you may be able to help them recover a "long lost" classic, and ensure its preservation for posterity.

The address to write to is the National Film Archive, National Library of Australia, Parkes Place, Canberra 2600.

Robots could improve the quality of life by taking over the dirty, boring and dangerous jobs currently performed by humans. What's more, these unusual employees could work 24 hours a day without a break, would thrive in hot and dirty conditions, and would never go on strike!

Automated manipulator looks, learns, assembles





Top shows the system picking up a bolt, while below is the bolt insertion.

It's a far cry from *R2D2* of *Star Wars* fame or Hal of *2001*, but it can "see", "feel", "think", and even learn.

"It" consists of a large six-jointed arm or manipulator, connected to a TV camera in the ceiling, tactile sensors in the hand and two microcomputers which co-ordinate and control its movements. Developed in SRI (Stanford Research Institute) International's Artificial Intelligence Center, the system can identify objects in various positions, pick them up and perform a variety of assembly operations.

At a recent demonstration before SRI's Board and Council members, for example, the manipulator picked up a bolt and pushed it into place to fasten down the cover of a small engine. To do this, it used a wrench that it selected from a variety of objects as the tool for the job!

The machine vision system also demonstrated its ability by quickly learning how to identify a watch belonging to one of the spectators and thereafter successfully identifying the watch each time it was presented.

The manipulator alone, without the visual or tactile sensors or most of the computer power possessed by the SRI system, is in common industrial use, particularly for welding and spray painting in automobile manufacture. The long production runs in this industry sometimes make it economic to build special-purpose equipment, known as "jigs", to hold the parts to be manipulated in a prescribed position.

This is necessary because, in effect, the manipulators are blind, deaf and dumb. They must be precisely programmed ahead of time in all their movements. They cannot make allowance for unexpected changes in the position or orientation of a part they are supposed to manipulate.

If the positioning equipment ceases to function properly, for example, the manipulator may "weld" the air.

According to Dr Charles A. Rosen, a senior scientific advisor in SRI International's Industrial Automation Center, there are about 2000 manipulators of this complexity in industrial use in the United States today. They range in price from $40,000 to $50,000. In Japan there are somewhat more and in Western Europe considerably fewer. Their use is increasing daily, he says, mostly in the field of automotive engineering.

Smaller versions that lack the control capabilities of the industrial manipulators described above and costing between $5000 and $15,000 are being used in industrial plants for pick and place operations — for example, to load boxes with parts, move the boxes from one place to another, and load and unload other machines.

According to Rosen, one of the main motivations for using robots in factories is to perform jobs that are unpleasant, dull, dangerous or bad for the health of human workers.

In the SRI version, the added visual capabilities and computer power greatly expand the manipulator's capabilities. The TV camera in the ceiling takes pictures of the object to be manipulated and the information contained in these pictures is processed by a computer, which directs the manipulator to perform the assembly task.

For example, in order to aid the system in bolting the cover onto the engine, the TV camera takes a picture of the engine with the cover on top but without the bolt. If the picture reveals that the engine is not in the right position relative to the arm, the computer directs the table on which the engine is sitting to move slightly and the camera takes another picture.

If this picture reveals that the engine is in the right place, the computer gives the manipulator a go-ahead signal, then guides it to pick up a wrench, use the wrench to pick up a bolt, push the bolt into a hole in the cover, and

tighten it. To assist the system in locating the wrench and bolt, the camera takes repeated pictures during the operation.

When the manipulator's tactile sensors reveal that the bolt has finally been inserted — presumably into the correct hole — the camera takes a final picture to make sure the job has been done satisfactorily.

Gerald Gleason, a research engineer in SRI's Artificial Intelligence Center, points out that the vision system recognises parts placed within its field of view by their shape only — regardless of their position and orientation. They need not be held in a jig — which is the usual way of allowing "blind" systems to find parts mechanically.

Gleason notes that the vision system can be trained quickly to recognise a new part placed within the camera's field of view. On a video screen the system draws a picture of the object to be identified, searches its memory for a similar part and comes up with a suggestion from among the objects already stored in its memory. If it finds nothing similar there, it types "Is it a new part?"

For example, when the system was asked to identify one of the spectators' watches, it searched its memory and asked if the object was a flange. Being told (via typewriter) that it was a new part called a watch, the system then stored the information regarding the object's shape and name in memory.

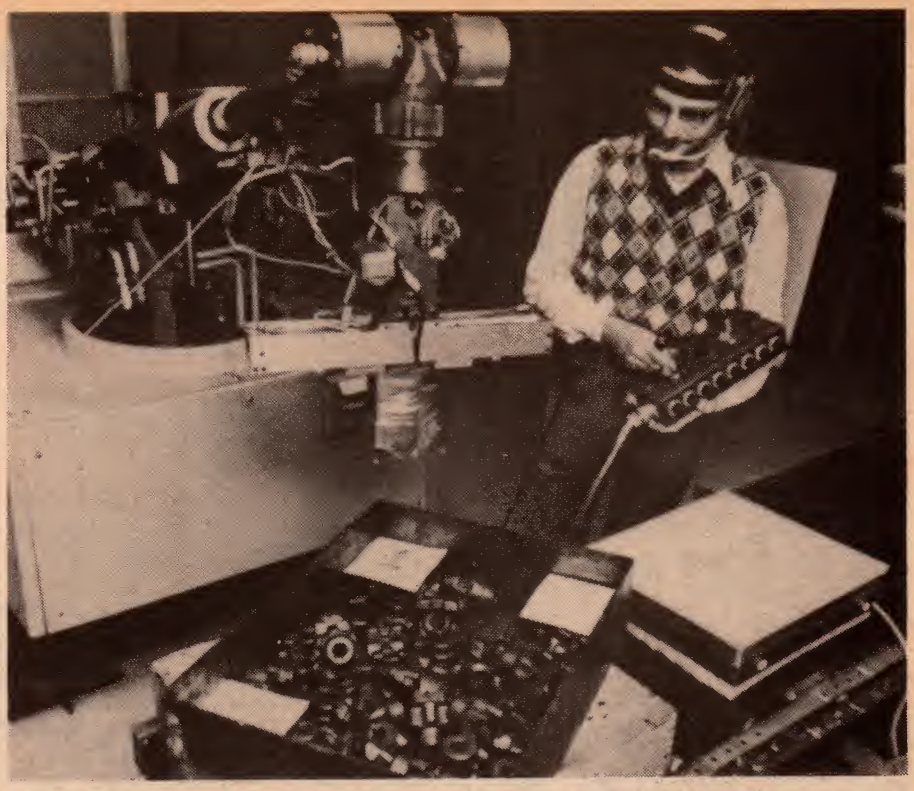
Gleason presented the watch to the system in several different positions, giving the correct name each time. Thereafter, the system correctly identified the watch whenever it was presented. He calls this procedure "training by showing".

Dennis F. McGhie, research mathematician in SRI's Artificial Intelligence Center, points out that the system could be used to perform visual inspections as well as to oversee the performance of a wide variety of assembly operations. He notes that the researchers have demonstrated the system's ability to recognise and manipulate parts moving down a conveyor belt.

According to Rosen, a trainable system incorporating vision, intelligence and manipulative capabilities would cost in the order of $75,000 at present. This is admittedly steep, but he points out that even at this price, such a system could be cost effective in a two or three-shift operation. And it would offer a number of potential advantages. For example, from the viewpoint of the manufacturer it offers:

- **Potential customisation.** With a few minor modifications, such a system might be used to assemble a small run of, say, five horsepower electric motors and another small run of two horsepower electric motors, within a very acceptable change-over time. With today's equipment, such product changes require costly changes in product line equipment.
- **Increased productivity.** Since the system could be used steadily around the clock and does not make "human errors", productivity could be expected to increase. Moreover, production costs would be lower than if the work were performed by human beings.
- **Improved product quality.** Product quality would be increased because of the elimination of human errors and increased control of the manufacturing process itself.

From the viewpoint of the worker, robots offer a potential improvement in the quality of life because they will gradually take over the low-level, dull and dangerous jobs, creating more interesting ones such as training and operating the manipulators. Of course, new jobs will have to be found for the displaced workers.



An operator trains the system to identify and pick up objects.

Shorter hours for human workers

At a United Auto Workers' Skilled Trades Conference on New Technology held recently and reported in the UAW's publication *New Technology*, Rosen said "there is no doubt in my mind that shorter work weeks, shorter work life, retraining programs and the generation of more service jobs will have to be done in the next 25 years if you're not going to have more people out of work."

However, he said, there will be plenty of time to make these changes because the high cost of the machines will delay their introduction.

"There are a lot of years for the unions to work out, together with the rest of the interested parties, what you do with these machines, how you introduce them, how fast you introduce them, what happens with the training of skills to operate them, and what happens to the millions of people who eventually will be replaced by the devices," Rosen said.

"You won't see a huge introduction of these machines for many years," Rosen went on to say. "But each year there will be more and more. The use of vision and other sensors and computers, together with the whole line of new robots, makes almost any assembly job possible. But many that require great dexterity will be very hard to do economically with robots.

"So one can visualise maybe a bottom of 10 or 15 per cent of assembly jobs still being done by people for a great deal of time, but a heck of a lot of other jobs can be done by the robots."

From the viewpoint of the United States as a nation, industrial automation is critical, Rosen notes, because of the increased productivity it will provide. "We can't hope to remain competitive in world markets without it," he says.

He points out that research in automation is being carried on actively all over the world. The Japanese are more active than we are, while research staffs in West Germany, Italy, Great Britain and Sweden are all doing extensive development in this area.

Reprinted from SRI International's "Investments in Tomorrow".

Sound reveals a hidden world

Recently developed at Stanford University, the acoustic microscope possesses the clarity of optical devices, but can probe features beneath a surface. The device will have important applications in integrated circuit manufacture and in the biological sciences.

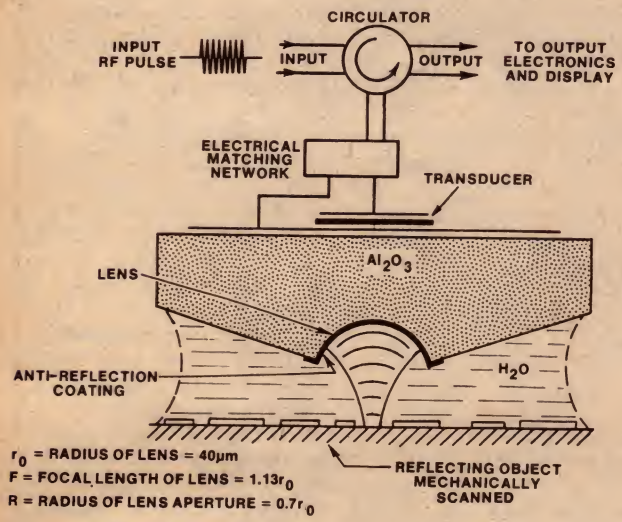
by JOHN H. DOUGLAS

Nature at large bombards the senses, but even a glimpse of the microscopic world requires the subtlest discrimination. Reflecting from tiny contours, an electron beam can reveal a gnat's eye as a surrealistic landscape of geometric patterns, but gives no hint at what lurks just beneath. An optical microscope transforms a living cell into a collage of psychedelic colours, but the internal properties of light conduction tell little about why some cancer cells metastasize. Now, extremely high frequency sound may enable scientists to explore these and other hidden features of microscopic subjects ranging from integrated circuits to blood cells.

An acoustic microscope that can see into a material as clearly as an optical microscope examines its surface has been developed at Stanford University by professor Calvin F. Quate and graduate student Victor Jipson of the Applied Physics and Electrical Engineering Department. The research was supported by the National Science Foundation and the Air Force Office of Scientific Research.

The basic idea is simple enough — the new instrument can be thought of as microscopic sonar, whose potential has been recognized for at least 30 years. The problem has been to create and focus sound waves at high enough frequency to reveal extremely small objects. As a rule of thumb, sound and light cannot form images of objects much smaller than their own wavelength, and to get wavelengths of sound comparable to those of ordinary light requires a frequency 100,000 times greater than any the ear could hear.

To solve this problem, Quate and his associates have pioneered the development of a series of instruments that use films of piezoelectric materials bonded to crystals to change electric currents into sound waves and back again. The waves generated by such a piezoelectric transducer are transmitted and focussed by the crystal, strike the object under examination, and are then reflected back to the transducer for reconversion to electrical signals. (In another version, sound is transmitted through the object and detected by a transducer attached to a crystal on the other side.)

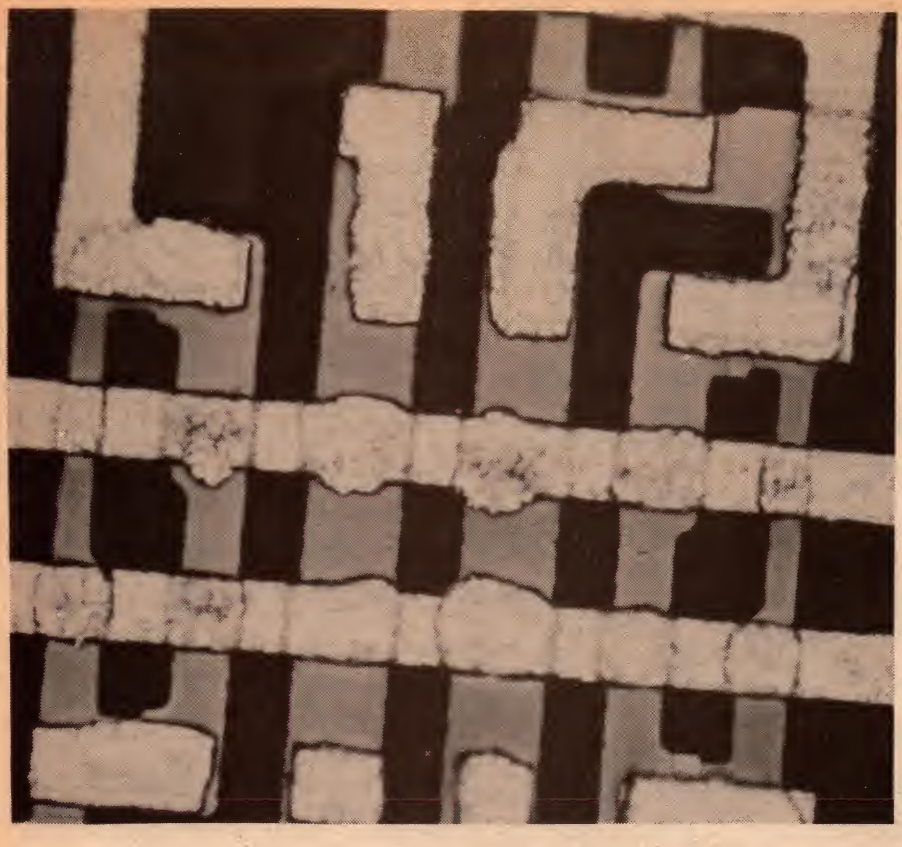


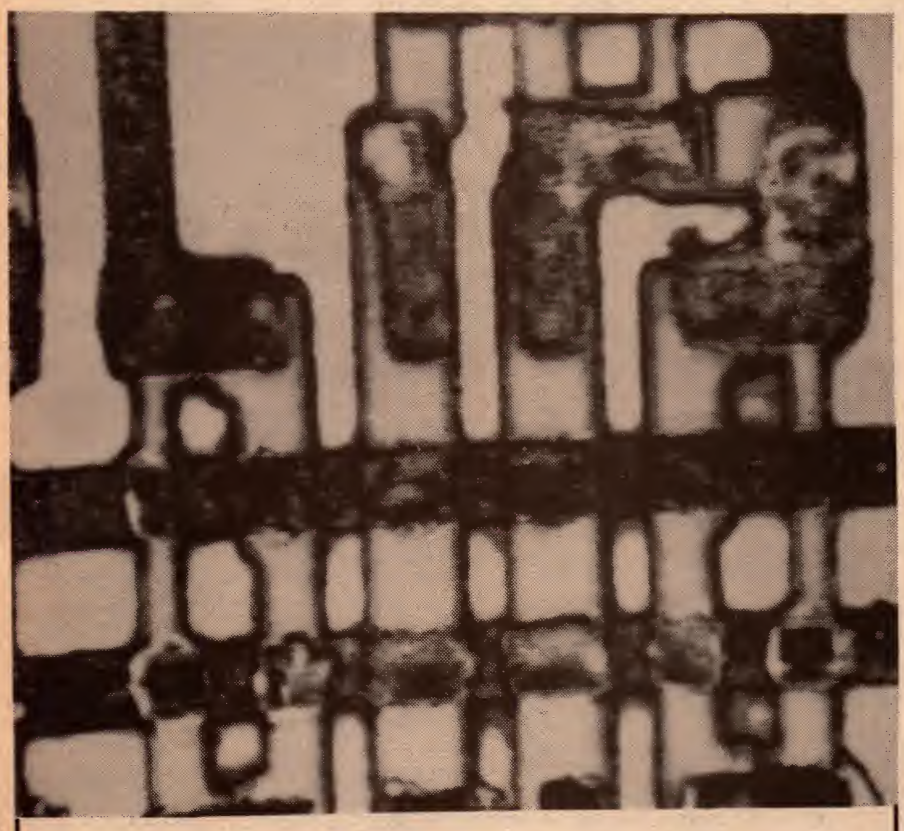
Configuration of scanning acoustic microscope as used in the reflection mode.

In their latest version, the Stanford team has produced sound waves with a frequency of 3 gigahertz (GHz = billions of cycles per second), and a wavelength of 520 nanometers — about the same as the wavelength of green light and giving a similar resolution of microscopic patterns. But unlike light, the reflected waves not only carry back information about the surface of the object under observation; they also reveal its internal structure to a depth of one or two microns. (A transmitting acoustic microscope can examine the structure of an object 5 to 10 microns thick.)

The ability to "see" a couple of microns into an object may not seem spectacular at first, but this immediate subsurface region can have critical importance. Take integrated circuits, for example: circuit elements are formed by depositing successive layers of material onto a crystal, and the success or failure of the circuit as a whole depends on having each junction well constructed. Acoustic microscopy promises a unique opportunity to detect flaws in such circuit elements, and a huge potential market is reportedly awaiting the new devices in this field alone.

Important biological applications also seem likely, although only preliminary investigations have been conducted so far. When a tumour spreads, the individual cancer cells appear to be able to slip through narrow channels that block normal cells. The difference in elasticity between these two kinds of cells does not reveal itself in a shift of refractive index (the ability of a medium to conduct light) but it may well show up under acoustic examination because the





Acoustics vs. optics — a comparison

Two views of an integrated circuit element: optical microscope looks at the surface of the element (top), while acoustic microscope looks beneath the surface (bottom). Acoustic microscopes will play an important role in IC manufacture in the near future.

conduction of sound does seem to be different. Similarly, the diagnosis of blood diseases is likely to be made easier because abnormal blood cells stand out more clearly to an acoustic microscope.

According to Professor Quate, the next step in the program will be to improve the resolution of the present instrument by perhaps a factor of two and decrease the scanning time from a few seconds to about a tenth of a second. (Scanning is done mechanically by passing an object back and forth in front of the sound beam.) A modest man who prefers to see his students take the limelight, Quate would speculate only cautiously about the ultimate impact of his instrument. Some private companies are considering commercial development, he says, but at least two years will be needed after the conclusion of negotiations to produce a marketable product. Such a commercial acoustic microscope would probably be priced less than a scanning electron microscope but still would be considerably higher than standard optical devices.

Meanwhile, the National Institutes of Health are considering funding further research into diagnostic possibilities of the Stanford machine and scientists from a variety of fields are beginning to realise they may have found a powerful new tool in acoustic microscopy.

Reprinted by arrangement with "Science News".

QUENTRON

Lasers for

* VOICE COMMUNICATIONS
* AUDIO COMMUNICATIONS
* OPTICS ALIGNMENT
* HOLOGRAPHY

QUENTRON
OPTICS Pty. Ltd.,
576 - 578 PORT ROAD,
ALLENBY GARDENS
SOUTH AUSTRALIA 5009

TELEPHONE: (08) 46 6121

Forum

Conducted by Neville Williams

Are modern phone discs really as bad as they're made out to be?

Every now and again, someone who should know what they are talking about, raises their voice — or their pen — to comdemn the quality of discs available on the Australian market. As often as not, they add a plea for high quality tapes. How does this accord with other well founded claims that to date, a vinyl disc represents the quietest and most practical medium for home audio entertainment?

We are most conscious of this conflict on those occasions when we read outspoken editorial opinion condemning discs in contemporary magazines; not just criticism of individual pressings, but a broadside at the record industry as a whole.

Why is it that we don't seem to get anything like as up-tight in the columns of EA? Do members of our staff and our reviewers lack perception, or are we too easy-going or careless?

Such questions were brought into sharp focus, recently, by a letter from a Western Australian reader who directs it to us in a last ditch attempt to highlight what, to him, is a major problem. He is a motivated spokesman for a whole sub group, so read on:

Dear Sir,

I was inspired to write to your magazine by the remark "Good luck", proffered when I complained to a dealer about surface noise on a couple of records I had bought, and said that I intended to take it up with the manufacturers.

I don't think I am the only one having to buy badly produced discs, and I mean the production of the disc, not the program content.

Everywhere I go, where records are mentioned, up comes the hoary old subject of bad discs. Some people I know buy almost exclusively imported discs. Others don't seem to care. My point is that if one buys a 2000 dollar disc reproducing unit (I'm not one of them, but it's not hard to do) all that one seems to get is 2000 dollars worth of surface noise!

Having been in the sound recording business professionally for about 25 years, and even cut original acetate discs myself, allow me to bring another aspect of bad disc noise into the arena.

Two recent discs I bought have cutter noise and squeak from the swarf. In other words the original master tape from abroad is clean, as is the pressing vinyl. The fault is with the acetate cutting here in Australia.

Being a technical journal I don't have to explain the disc manufacturing process, but I do object to paying high prices for a disc that someone has made a lousy job of cutting. Either the cutter was blunt, or not hot enough. Or someone just let the swarf curl around the cutter.

The irony of it is that the original acetate can be checked by a careful once-only playback and these faults picked up before pressing.

"Strange . . . that's like the sound I hear from my hifi at home, when the music stops!" ("Electronic Age").

But, to get back to the "good luck" remark, it surely indicates that the record companies are concerned only with the majority. They sell mostly to a public which is accustomed to compressed sound that masks the noise, except between tracks. And who listens that carefully these days, anyway? In such circumstances quality of sound and processing doesn't have to be all that good.

The crunch comes for us aware audiophiles, when there is a track with, say, a single piano entry or something with low dynamics at the start. It is then that one is conscious of the gouging noise, especially evident on the two discs I have just bought.

I don't really expect this letter to cause a revolution but the fact is that a large hifi following does buy discs. Maybe we should be waiting for reasonable reel-to-reel dubs ("they don't cater for the minority") or digital recordings.

Me . . . I don't buy many discs, these days; I just write letters. Maybe I'll be dismissed as an in-the-business freak!

E. M. (Greenwood, W.A.)

First let's assure E.M. that we are not about to treat him as any kind of freak. Nor are we about to agree with him, or to disagree. The subject has so many "ifs" and "buts" that it does not allow for a simple yes-no response. Let me illustrate:

Recently, a relative complained bitterly about the noise level on a record he had just purchased, and insisted on bringing it over so that I could hear it. To his amazement, the disc didn't seem all that bad on my gear. When I repaid the visit a few days later, I took with me another pickup cartridge to substitute for his. The difference between the two in terms of apparent record surface noise, was quite startling.

From past experience, it seemed clear that his ageing magnetic cartridge had a peak in the upper middle register — probably associated with a tendency to "ring", when excited by transients. With such a cartridge, surface clicks and plops can be magnified and prolonged to a degree where they become far more noticeable than would otherwise be the case.

(One should perhaps add, for the sake of completeness, that an upper-middle peak in the loudspeaker system can produce much the same result. Pity the owner of a system where the cartridge and speaker(s) are both suspect!)

One effect of such a mid frequency prominence is to exaggerate the difference beween good and not-so-good discs. A disc without surface flaws remains "perfect", but "neglibible" surface noise becomes noticeable, and "noticeable" surface noise becomes awful!

In my experience, the flatter the

system overall, the less one tends to be aware of record noise.

Another factor which complicates subjective evaluation of noise is the age of the listener(s) involved and the effect of the passing years on treble acuity. Clicks, plops and background hiss, which may be apparent to a 20-year-old, are likely to be less so to his/her father, and of little concern to the grandfather!

Again, there is the question of psychological sensitivity to record noise. Reading some of the British magazines in particular, one senses an almost near obsession with clicks and plops, and the gadgetry with which to combat them.

And, of course, there is that kind of attitude which makes it difficult for some to admit to enjoying any mass produced disc (or cassette), lest they should seem to be endorsing a compromise! They effectively counterbalance those who become so absorbed in the content that they can ignore the medium!

All this makes life particularly difficult for reviewers, who have to write for a wide cross-section of readers: the young and the not-soyoung; the critical and the tolerant; the owners of expensive equipment and those who operate a modest three-in-one. Those who concentrate on the program and ignore the noise . . .

And those who seem almost to do the reverse!

We at EA tend to take a median position, based on products and expectations as they are at present. We rate as good those discs and tapes which we feel will satisfy the average, reasonably perceptive buyer.

We praise out loud those recordings which are outstanding by present-day commercial standards, and these are undoubtedly the ones from which the hypercritical should pick and choose.

We draw attention to those with obvious shortcomings, so that buyers will know what to expect.

I would be disappointed indeed if one of our reviewers missed a swarf squeak as obvious and objectionable as E.M. makes it appear. But was it all that obvious, and would it be noted by someone who had not had his senses attuned to such an effect by actual experience on a cutting lathe? I don't know, but two out of two is a startling ratio for what, in my experience, is a rare phenomenon.

I, personally, tend to differ from EM in that, if I were to express reservations about present-day commercial recordings, they would relate more to the source than the vinyl pressing. Acoustics, miking and mixing all have a profound influence on the end result, as does the number of tape transfers before the signal actually reaches the cutter drive — or the cassette recording amplifier.

It could well be that, if EM, at considerable cost, was able to buy commercial reel-to-reel dubbings from the same sub-sub-sub(?) — masters, he would still be disappointed. Certain it is that audiopholes within the domestic recording industry are concentrating tremendous effort into the pre-pressing area,

I wonder, too, about the sometimes enthusiasm for imported discs and the implication that what we do badly here, they consistently do well overseas. Maybe we are comparing their hand-picked best with our local average. And, remember, some of the countries from which we import, themselves have a ready audiophile market for . . . imports!

EM lays considerable stress on the fact that discs are produced for the majority market, of course they are.

So also are motor cars, clothes, appliances, packaged food and just about everything else we buy!

Almost by definition, a connoisseur is fated to reject the mass-produced article and to strive for what is less average, less accessable — and often a darned sight more expensive!

Having thoroughly condemned and rejected local mass-produced records, EM may well have talked himself into the ranks of the connoisseurs (and maybe the curious) who appear to be queueing to buy audiophile discs from the various sources at around $19 a pop. (What an unfortunate turn of phrase!)

But here we have to inject yet another qualification: a purist heritage and an elevated purchase price is not an automatic guarantee that a record will be extraordinary. In fact, some program material makes such modest demands on advanced technology, in the way of response and dynamics, that it could have been recorded quite comfortably by conventional methods.

If one may attempt to summarise all this in a few paragraphs, my own experience would suggest the following:

- A significant proportion of the LPs on sale are undisputedly disappointing for reasons ranging all the way from the original performance to the quality of the final pressing. Presumably the discs which triggered E.M.'s complaint would fall into this category and I don't blame him in the least for camplaining.
- The majority of LPs in the catalogs satisfy the majority of listeners, in that they provide them with the program content they want without unduly off-putting faults. Counted among these "average" listeners are many with above-average equipment.
- A significant number of discs are above average in respect to content and/or engineering and should satisfy all but the hypercritical. Those wanting to identify these top quality but otherwise normal commercial releases need to watch the reviews, listen to broadcasts, &c.

D.I. SERIES

P.A. AMPLIFIERS

THE FINEST SYSTEM AMPLIFIERS IN AUSTRALIA

Compare these technical features:—

- XLR microphone sockets.
- Balanced low impedance microphone inputs.
- Separate bass and treble controls.
- Constant voltage and multi-tap low impedance outputs.
- Master gain control.
- Self contained or rack mounting

LOW COST

35 watt $177.00

60 watt $220.00

100 watt $266.00

from the BOGEN people

AUDIO TELEX COMMUNICATIONS PTY. LTD.

SYDNEY
54 Alfred St.,
Milsons Pt, 2061
Tel: 929 9848

MELBOURNE
7 Essex St,
Mt. Waverly 3149
(03) 277 5311

BRISBANE
294 Montague Rd.,
West End, 4101
Tel: 44 6328

ADELAIDE
Werner Industries,
Unit 5, 28 Gray St.,
Kilkenny, 5009
Tel: 268 2801

PERTH
Electro Acoustic Co.
55 Frobisher St.,
Osborne Park, 6017
Tel: 444 8688

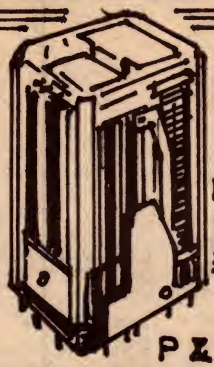
HOBART
Video & Sound Services
11-13 Andrew St.,
North Hobart, 7000
Tel: 34 1180

TRADE ENQUIRIES INVITED

GREAT RELAY CLEARANCE AT UNREPEATABLE PRICES

JUST LOOK AT THESE PRICES!!

ONCE IN A LIFETIME OFFER OF PYE-TMC CRADLE RELAYS

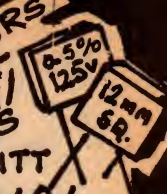


ALL RELAYS ARE NEW & UNUSED

P & P EXTRA

PART NO:	TYPE	COIL IMP.	CONTACTS	OP. VOLT	PRICE EA
602158 590115	BASE MTG. "	6·4K+6K 15KΩ	4 MAKE 2 c/o H.D.	45-120V 65-178V	25c
602346	BASE MTG	2·5KΩ	2% 3 MAKE	26-72V	30c
591002 591003	BASE MTG BASE MTG.	1KΩ+1KΩ 1KΩ+1KΩ	4 c/o 2 c/o	8-45V 10·9-44V	60c

SILVER MICA CAPACITORS AT GIVE-AWAY PRICES



ITT

125V ½%

ONLY

25c EA.

LISTS AVAILABLE

FIRST TIME OFFER

SPRAGUE COMPUTER GRADE ELECTROLYTICS

160,000uF 10V. $15.

100.000uF 10V $10.

P & P $1.25

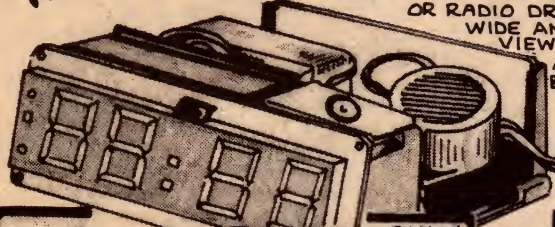
EXPLOSIVE SCOOP PURCHASE OF

FAIRCHILD FCS 6100AD CLOCK MODULE

WITH THESE FEATURES

- 0·6 INCH DISPLAY
- STANDARD TRANSORMER
- 240V 50 OR 60Hz OPERATION
- AM/PM SEGMENT INDICATOR
- POWER FAILURE INDICATOR
- SIMPLE BUILT-IN SWITCHING
- 59 MINUTE SLEEP TIMER
- SECONDS DISPLAY ON COMMAND
- 12 OR 24 HOUR OPERATION
- BUFFERED OUTPUT FOR ALARM OR RADIO DRIVE
- WIDE ANGLE VIEWING
- ALARM BUZZER

For immediate use — No Extras required



ONLY $14.95 P&P $1.50

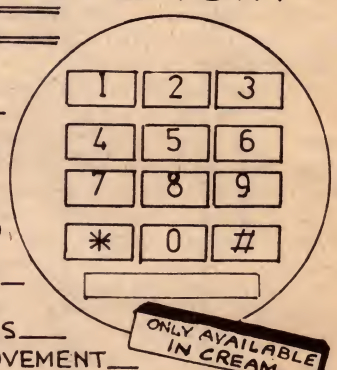
SUPPLIED WITH COMPLETE DATA

Exclusive to us!!

&

AUTOMATIC TELEPHONE DIALER WITH MEMORY

PUSH-BUTTON TYPE



FEATURES

- FITS DIRECTLY INTO MOST PHONES
- WILL MEMORISE LAST NUMBER DIALED FOR 10 MINUTES
- 2 RECALL BUTTONS
- WILL MEMORISE I.S.D NUMBERS
- POSITIVE BUTTON MOVEMENT
- FULLY GUARANTEED • LOW MAINTAINANCE
- EXTERNAL POWER SOCKET FOR INDEFINATE MEMORY HOLD

only $59.95 P & P $1.00

CONVERT THE OLD FOR THE NEW !!

TRADING HOURS

MON-TUES-WED & FRI: 9am-5.30pm. THUR: 9am-7pm. SAT: 9am-12 noon. COD's Please add $2.40 to posting fee. NO ORDERS UNDER $5.00 ACCEPTED (exclusive of P&P) For replies please send SAE. Post and packing 50c where not included in price

bankcard welcomehere

SHERIDAN ELECTRONICS

TELEPHONES 699 5922 699 6912

164-166. REDFERN ST., REDFERN. NSW 2016. P.O. BOX 156. AUSTRALIA.

FORUM — continued

- Special quality discs for audiophiles are available from a variety of sources. Some are superb; some have limited program appeal; some show no special advantage over a normal top quality commercial release at half the price. Again, watch the reviews, &c.
- For as long as analog discs and cassettes remain current, digital techniques offer the best way round present-day hassles to do with recording, mastering and dubbing. Digital mastering combines the flexibility of tape with the virtues of direct cut.
- It seems certain that digitally encoded discs and tapes will be the next big development in the consumer audio field. They have tremendous technical potential but standards will have to be determined, acceptable consumer products developed and a large inventory of recordings built up before they can even begin to eat into the established analog way of doing things.

To change the subject rather abruptly, we have received a considerable amount of correspondence from P.T. of Clarence Gardens, S.A. on the subject of the Metric System. He was annoyed by Peter O'Neill's article "Electronics and the Metric System" (July 1978) and set about to convince us that the whole concept was wrong, wasteful, inefficient, an impost on industry, and a horror for little old ladies.

However, we were vastly intrigued to note that, having blasted metrics and championed the Imperial system, he carried right on to say that, if we were going to change the system at all, we should build a completely new one around the figure 12 — in short, adopt the duodecimal system of counting.

So, having shed hot tears for the little old ladies (why not for the little old gentlemen?) who are currently dismayed by metres and litres, he flinched not at all from the prospect of teaching them to count in twelves!

None of this made our columns, for reasons which were explained in our January issue and we stand by them. But he got through our defences with a letter containing this gem:

"Naturally I found 'Forum' in the January issue most interesting. Incidentally, to bring the cartoon down to a more serious note, you probably know that wavelengths were usually expressed in feet until World War I; and since the measurement in metres is only an approximation for most purposes, e.g. 1MHz = 300m, a more logical approximation is 1MHz = 1,000 feet which is almost as accurate. The 40m (7MHz) band then becomes the 144 ft. band! A nice round modular length. And 28MHz becomes a dozen yards."

"Forsooth! From the deck of this proud ship, I forsee the day when yonder mount will be a fine place for amateur beams on the rod band and the chain band!"

Well, one learns something new everyday!

I can only say that, after best part of a lifetime working and reading items about wireless-radio-electronics, this is the first time I've ever come across the concept of wavelength being expressed in feet.

What's more, when I turned up "The Wireless Telephone" by Hugo Gernsback, published in 1911, I learned that the "Jewellers Time Receiving Outfit" designed to intercept signals from the U.S. Navy yards, tuned the range up to 2500 metres.

Americans using metres . . . in 1911!

But the "144ft" band? I like it!

And the "dozen yard" band? You beauty!

Without even trying, P.T. has provided that touch of humour that seems so appropriate for the April issue.

Imagine all those novice amateurs: licensed to operate on the dozen yard band and the half-furlong band, as well!

I'm really enjoying this but I wonder how many others are? Thinking back to the January cartoon, I wonder how many readers have even heard of rods, poles, perches, chains and furlongs?

They used to be printed inside the covers of our school exercise books in an apparent attempt to impress upon us their unlikely relationships which, from an inch to a mile read: 12, 3, 5½, 4, 10 and 8!

The passing of such a table I cannot lament but I do wonder how the next generation of songwriters is going to get on in trying to parallel the ditties of yesteryear:

"I'd walk 1,609,000 kilometres for one of your smiles . . . Mammy!"

Can you afford not to know about microprocessors?

This book will help you find out what the revolution is all about. . . .

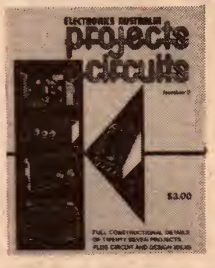
GETTING INTO MICROPROCESSORS

Available from "Electronics Australia", 57 Regent St, Sydney. **PRICE** $4.50 OR by mail order from "Electronics Australia", PO Box 163, Beaconsfield 2014. **PRICE** $5.10.

OUR LATEST HANDBOOK

PROJECTS & CIRCUITS

NUMBER TWO

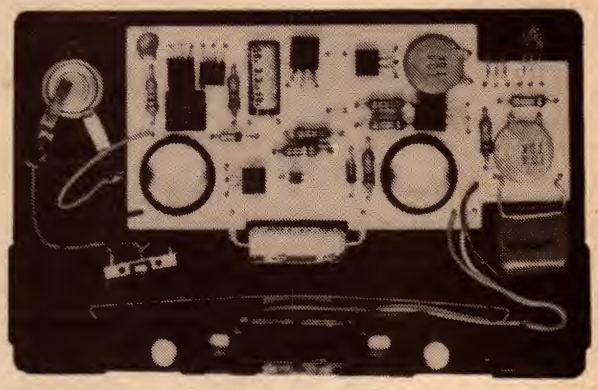


27 DO-IT-YOURSELF PROJECTS FROM ELECTRONICS AUSTRALIA

You can't afford to miss out on this exciting new book from "Electronics Australia". Here are just a few of the projects it contains: remote TV headphones, multi-band vertical aerial, roulette wheel, radar burglar alarm, model train control, voice-operated relay, transistor tester, water level alarm . . . plus many more. Get your copy now!

Available from:
"Electronics Australia", 57 Regent St, Sydney. **PRICE $3.00** OR by mail order from "Electronics Australia", PO Box 163, Beaconsfield, 2014. **PRICE $3.60.**

TDK's Revolutionary New Product — The HD-01 Head Demagnetizer Built into a Cassette Shell.

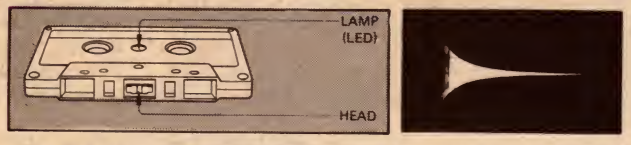


Simply load the HD-01 into any cassette recorder as you would a standard audio cassette and depress the 'play' button.

The HD-01 Head Demagnetizer was designed by TDK for easy, convenient head demagnetization of any cassette deck, insuring crystal-clear, perfect recordings every time.

The TDK HD-01 Head Demagnetizer features:

- A unique cassette format, designed to insure complete compatibility with any cassette deck.
- Powerful de-gaussing circuit instantly demagnetizes recorder heads the moment the play button is depressed. The above diagram depicts the oscillating waveform applied to the recorder heads, removing every trace of residual magnetism in only one second!
- A red LED (Light Emitting Diode) built into the HD-01 cassette shell will light up the moment your recorder heads have been completely demagnetized.



The TDK HD-01 Head Demagnetizer ends forever the fuss and mystique surrounding the demagnetization process and is much easier to use than conventional wand-type tools. Anyone can use the HD-01 and get perfect results every time.

The TDK HD-01 Head Demagnetizer is completely self-contained, battery operated and portable. It can be taken anywhere and stored with your present audio cassettes. The TDK HD-01 is ideal for all types of cassette decks especially those with heads located in hard to get at places such as:

- recorders with heads positioned in the front of the unit but which point to the rear.
- those with 'pop up' loading mechanisms which can not be detached, thus making the heads almost inaccessible.
- cassette decks with heads positioned laterally with respect to cassette loading (car decks are good example of this type).
- automatic loading machines.

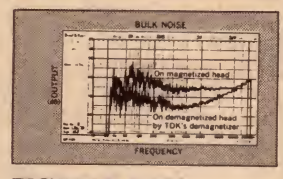
WHY IS DEMAGNETIZING SO IMPORTANT?

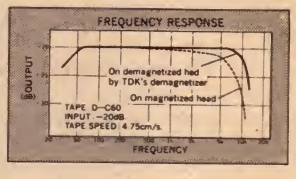
TDK, in conjunction with many cassette deck manufacturers, recommend that cassette decks be maintained on a regular basis. Cleaning the heads, capstan and pinch rollers is one important aspect of that maintenance program. — Periodic demagnetizing, about every thirty hours of use, is the other. Failure to do so will cause a build-up residual magnetism on the heads, which can seriously affect tape and machine performance in the following critical areas:

1. The noise level in the low and midrange frequencies is increased by 5 to 7dB, thereby reducing the overall signal-to-noise ratio.
2. Pre-recorded tapes can also be affected with midrange and high frequency distortion, as well as attenuation by as much as 2 to 6 dB, virtually eliminating any hopes for clear sound reproduction.

The interaction of these factors will not only prevent both the tape deck and tape from displaying their true performance capabilities, but will severely limit the Dynamic Range properties of both, rendering pure sound reproduction an impossibility.

The following comparison data clearly demonstrates the effect of residual magnetism on recorder heads in the areas of both Noise Level and Frequency Response.





TECHNICAL DATA

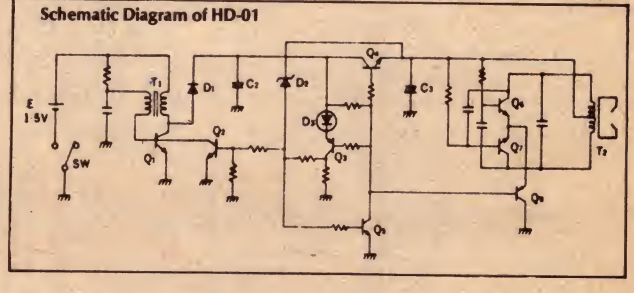
Major Components:
Transistors (8)
Diodes (2)
LED (Light Emitting Diode)

Power Supply – Control Section – Oscillation Section – Head Section

Specifications:

Maximum Magnetic Flux Density	200 Gauss
Oscillation Frequency	630 Hz
Shape	(External Dimensions) Conform to IEC Standards
Battery for Power Supply	G-13 1.5 volt, Silver Oxide Battery (option)

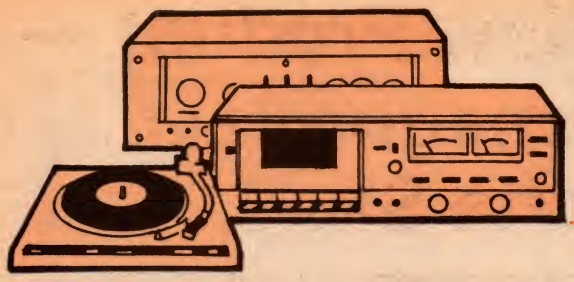
Schematic Diagram of HD-01



For additional information, direct all inquiries to:

CONVOY INTERNATIONAL PTY. LTD.
4 Dowling Street, Woolloomooloo, N.S.W. 2011
Telephone: (02) 358-2088. Telex: AA23111

TDK®



Hi Fi Topics

A WIDE-BAND AM TUNER IN 1935 — WHY NOT NOW?

Anyone who's grown grey in the audio field, and who happened to see the February issue of "Audio" magazine could be excused for mentally wandering off down memory lane. In the particular issue was an article by J. F. W. Puett on the Scott series of high quality radiograms. It caused us to go looking for other references.

by NEVILLE WILLIAMS

When typing the above introduction, I was inclined at first to use the world "nostalgic" but it would hardly have been appropriate. One can be nostalgic about things and situations that one might have owned or had access to, but a Scott receiver: that was as far out of my (our?) class in those days as the latest model Rolls-Royce.

Nor is the parallel inappropriate. In his listing of period receivers, another author, Morgan E. McMahon ("A Flick Of The Switch, 1930-1950") describes the Scott receiver as being in the "Cord-Auburn-Duesenberg" league.

The particular line of receivers dates back to about 1924 when E. H. Scott, of the Scott Transformer Company, decided he would get into the business of building bigger and better radios for the American market. His ambition was summed up by the motif which became the badge of the product: a violin within a circle, and the words "SCOTT The Stradivarius Of Radio".

At the time Scott was obviously not alone in this ambition because, over and above the standard offerings featuring bakelite panels and dials, companies like DeForest, American Bosch and Zenith were advertising deluxe models for deluxe homes.

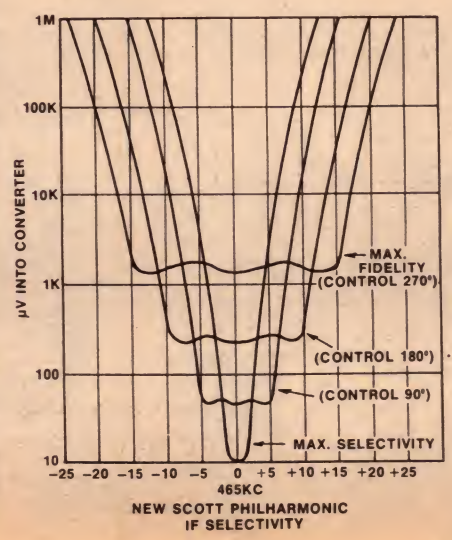
Scott's aim was to out-deluxe them all, in terms both of presentation and technical performance, and he was successful to the point where his receivers became the prime choice for many musicians and engineers, along with those who simply wanted the best.

In 1928, when most manufacturers were content to provide adequate broadcast band reception, Scott produced a high quality all-wave receiver and this, together with a change of name to the Scott Radio Laboratories, laid the foundation for the prestige receivers which were to follow.

The "all-wave" theme was prominent in Scott advertising during the 30's and early 40's. Even in 1934 the "All-Wave Deluxe" boasted the then-imposing complement of "15 tubes". In 1939, the company was offering the "World's Most Powerful Radio", "Used in 154 Countries" and inviting the would-be customer (rather ominously) to "Get the true picture ... as the map of Europe changes day by day".

In the technical area, his company was credited as being the first to market receivers using screened grid valves, the first to exploit "super-control" valves and the 57/58 series, and the first to use multiple RF stages ahead of the frequency changer in a superhet.

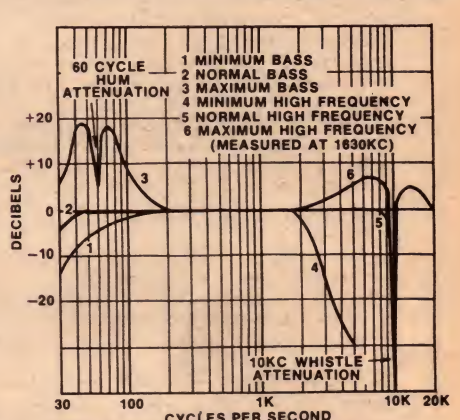
As a matter of necessity, the emphasis on interstage shielding grew with a complexity of the circuitry and this, too, developed into a feature in more ways than one. Chasses and shields were styled and heavily plated so that the receivers themselves where often treated as gleaming showpieces, exhibited and used without cabinets. The shielding was also functional and an exhibitors' trick was to operate a Scott receiver (with a remote antenna) in the immediate environment of interference that would penetrate the circuits of rival brands.



NEW SCOTT PHILHARMONIC IF SELECTIVITY

Scott pioneered band switching rather than plug-in coils, high adjacent-channel rejection, flat-topped variable selectivity, full-range audio response from 30Hz to 16kHz, and circuit implications which followed from this. In the factory, his engineers devised a variety of then-novel component testing and quality control procedures: rotators, vibration tables, refrigeration equipment and, at the other extreme, temperature and humidity chambers.

In 1935 Scott Laboratories released the "All-Wave Imperial" for the luxury hifi market. Employing 23 valves in all, it culminated in an output stage featuring



NEW SCOTT PHILHARMONIC OVERALL FIDELITY MEASURED AT 600KC

RESPONSE TO 16kHz

Any AM tuner which appeared on the market today with IF selectivity curves like those on the left would make headlines in the hifi media. Above is the claimed overall response at 600kHz. There are three levels of bass, including a 60Hz hum filter. The treble can be attenuated as shown, or operated level or boosted, in the latter cases including a 10kHz filter.

A major independent research company proved that the ADC XLM MKII incurred no perceivable record wear over the life of your records!
Since then ADC's massive research programme has created a new state-of-the art, top of the line model–the ZLM Aliptic–designed for ultimate stereo performance combined with the concept of zero record wear.

Greatly reduced tip mass

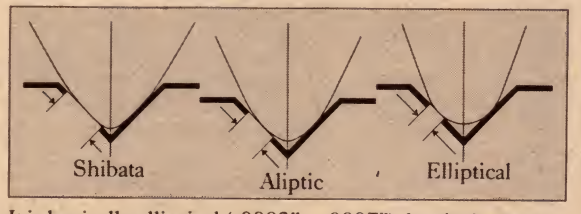
The ZLM has a tiny nude diamond with a ·004" x ·008" rectangular shank.
This achieves more lateral strength than the fashionable ·006" square shank, plus a 10% reduction in mass.
The diamond is mounted on a new tapered stylus, which again reduces mass.
In fact, the ZLM has only half the tip mass of the famous ADC XLM MkII.

Less mass by patent

The patented ADC Induced Magnet system, where the magnet is suspended over the moving stylus arm instead of being attached to it, inherently means less mass for the record groove to move. This, coupled with major innovations in the pivot block stylus suspension (which have solved deficiencies in the old system), has resulted in greatly improved frequency response characteristics.

New low-wear ALIPTIC shape

The ZLM has a new tip shape that combines the advantages of the elliptical and Shibata shapes, while eliminating their disadvantages.



It is basically elliptical (·0003" x ·0007"), but its bottom radius has been modified to extend the vertical bearing surface on the groove wall by 100%.
Large enough to greatly reduce record wear, while still small enough to prevent dirt particles being reproduced.
This new shape is called ALIPTIC.™

The best polish available

We decided it was worth the extra cost to get the ultimate polish for the ZLM.
The method involves a cam action to shape and polish evenly while forming the elliptical surfaces simultaneously with the other radii. This Pathe-Marconi method is expensive, but the result makes another important contribution towards reducing record wear.

Spatial sound

You'll notice a distinct difference in sound quality.
Words such as 'open,' 'spatial,' 'uncoloured' and 'true' spring to mind. Individual instruments are easily identified, and there's no hint of listening fatigue.
That's strictly for the competition with its peakier response.

The new ZLM Aliptic

The culmination of all ADC's research has resulted in the new ZLM Aliptic.
Its specifications below are some of the most impressive around, and with each cartridge you receive an individual, signed, frequency response testimonial.
Certain ZLM's fall within a range of ±½db 10Hz to 20kHz and ±1dB out to 26kHz.
These rare cartridges are called ZLM Select and are only available on special order.

The best cartridge we've ever made

The ZLM is without doubt the best cartridge we've ever made, but it's well worth taking a closer look at the new ADC XLM III which incorporates all of the reduced mass accomplishments of the ZLM, but with a tiny elliptical diamond. This also includes an individual specification.
Complementing the range, we have the new four-cartridge QLM Mk III series, incorporating our new design criteria and exciting innovations like the Diasa (diamond + sapphire) elliptical tip.

ZLM Aliptic specifications

Diamond tip	Nude Aliptic
Tracking force	½ to 1¼ gram
Frequency response	10Hz to 20kHz ±1dB 20kHz to 26kHz ±1½dB
Output	1.0mV per cm/sec
Output balance	1dB max. diff.
Channel separation	30dB at 1kHz/20dB at 10kHz
Inductance	580mH
Resistance	820 Ohms
Load resistance	47,000 Ohms
Load capacitance	275pF
Cartridge weight	5.75 grams
Accessories	Stylus brush, screwdriver, all mounting hardware and signed frequency response curve.

Please write for our illustrated brochure.

The new ZLM Aliptic™ cartridge. The difference between playing your records and wearing your records.

ADC

A BSR Company
Distributed by: EXPO International Trading Pty Ltd
27 Buckley St., Marrickville NSW 2204

BSR (A'asia) Pty Ltd. Anne St., St. Marys NSW 2760

BSR151

four 2A3 power triodes in push-pull parallel delivering a magnificent (for the period) 35 watts of undistorted power. It used two separate chasses, one for the tuner, the other for the power amplifier.

The story goes that, soon after their release, a Scott Imperial was made available to each of four theatres in Chicago, in the hope of bringing to their audiences a broadcast of the Joe Louis v. Max Baer heavyweight championship bout. Not only did the receivers outperform rival bands in picking up the distant broadcast, but they proved capable of delivering the necessary audio power without resort to the theatre sound system!

Quite a nice piece of publicity, for sure.

As for Scott cabinetwork, the precautions and processes read like a fantasy in these days of particle board and instant everything: seasoning natural timber in open air for one to three years; kiln drying and steam treatment to remove acids; kiln processing over a period of weeks, gradually to reduce moisture content, followed by special treatment to inhibit moisture re-absorption.

Only after all that did the traditional-

(Continued in column 3)

Just in case you thought that high performance audio equipment had to be large, Toshiba have demonstrated otherwise with their new "Aurex" system. Its four components — (from top) power amplifier, control preamplifier, tuner and front-loading cassette deck — can be stacked in a space two-thirds that required by full sized components: 318mm high, 275mm wide and 211mm deep. Yet you get a dual-motor deck with very low wow and a variety of features, an FM tuner with digital display and channel presets, a low distortion preamplifier, and a 40W per channel power amp with a THD of 0.02%. (Details from Toshiba (Australia) Pty Ltd, 16 Mars Rd, Lane Cove, NSW 2066).

New Ortofon products from Harman Aust.

The many EA readers who, a few years back, formed an attachment for Ortofon phono cartridges, will be interested to observe the new range of Ortofon products currently appearing on the hifi market. The emphasis is still on quality and quality control but, thanks to automated assembly methods and computer controlled testing, Ortofon have managed to contain and even reverse price rises.

Pictured at the top left is the new top-of-the-line Ortofon MC 30 moving coil cartridge. It heads a line-up of MC cartridges including the MC 20, MC 10 and SL 20 Q.

Each MC 30 is exhaustively tested before release and is packaged with its individual performance figures. Published specifications suggest a frequency response to 60kHz, but one that is within plus and minus 1dB between 20Hz and 20kHz. Channel balance is better than 1dB, distortion less than 1% and stereo separation typically 25dB or better up to 15kHz.

Of the other two units pictured, the T 30 is a super quality transformer intended to go between a moving coil cartridge and the usual 47k input circuit provided for a magnetic cartridge. It is virtually flat from 10Hz to 110kHz and can accommodate cartridges of 3 to 48 ohms impedance.

The MCA 10 is a low noise, battery powered pre-amplifier for those who may prefer this approach.

For furhter details: Harman Aust Pty Ltd, PO Box 6, Brookvale, NSW 2100.

ly trained cabinet makers and finishers begin their dedicated — and protracted — task.

The aim, of course, was to produce cabinets which could stand alongside the finest furniture that might be found in American mansions in the 30's — and who cared about the cost?

According to J. W. F. Puett, the Scott "Quaranta" was something of an ultimate. It was, indeed, the end result of the Company being commissioned by a wealthy customer to create the most elaborate practical sound system for the home, with cost no object!

The tuner already in existence for the "All-Wave Imperial" seemed to defy further elaboration but the audio system (a mere single-channel 35 watts) was a candidate for expansion.

The "Quaranta" ended up with two distinct power amplifiers, each rated at 50 watts undistorted. One handled frequencies between 30 and 125Hz, the other frequencies from 125Hz to above audibility. Levels were separately controllable and a system of automatic volume expansion was provided to enhance the dynamics of available program material.

All this, driving five loudspeakers and housed in two magnificent hand-carved cabinets was offered for $2500 — no mean sum for a receiver today, let alone in 1935!

In 1940, Scott Laboratories anticipated the future with their all-wave AM/FM receiver and this was followed by others and by a venture into the new field of television, with projection TV

SHAWMUT®

Electronic Components and Materials

PHILIPS

STATE OF THE ART FUSES

Electronic products are becoming increasingly sophisticated, and Shawmut engineers work closely with "state of the art" circuit designers to meet and exceed the protective needs of their products.

The Form 101 series of current limiting rectifier fuses protects semiconductor power diodes (rectifiers), thyristors, triacs and other solid state devices against short circuit faults to which they are particularly susceptible because of their intrinsic low overload capability. Short data is listed below.

These Shawmut fuses are available off-the-shelf in a range which can meet your most critical specifications.

The popular "One-time" switch and panel fuses and the "Trionic" dual-element motor starting and protection fuses are also listed. Many other fuse series are available for electrical applications.

SHAWMUT FUSE DATA

Fuse Type	Amp. Ratings	A.C. Volts	Dimensions	U.L. Class	Interrupting Rating A.C. RMS Amps	Where Used
ONE-TIME	1-600	250 600	N.E.C. Holders	K-5	50,000	Switches, Panelboards fusible equipment
TRIONIC Dual Element	1/10-600	250 600	N.E.C. Holders	RK5	200,000	Motor starting and protection.
AMP-TRAP Form 101 Rectifier fuses	1-10,000 1-5000 1-2000 35-1600 20-1600 20-1600 20-800 20-800 20-600 20-600	130 250 600 500 700 1000 1200 1500 2000 2500	Clip or Bolt Mounting	*N.A.	200,000	Semi-conductor, rectifier, diode, SCR protection. D.C. power supplies Inverters U.P.S. systems Controls Variable speed drives Mine power supplies Special applications, A.C. or D.C.

*Not applicable

For details of the full and comprehensive range of Shawmut fuses contact:
Philips Electronic Components and Materials,
P.O. Box 50, Lane Cove, N.S.W. 2066
Ph: (02) 427.0888

AVAILABLE THROUGHOUT AUSTRALIA FROM

CEMA AND SOANAR

PHILIPS

153.0241

receivers on offer in 1949.

But E. H. Scott had left the company in 1945 and it gradually faded from the scene.

However, the fact remains that, if one is looking in the marketplace for examples of AM receiver technology at its finest, it may be hard to better designs that were created by Scott Laboratories in the middle thirties.

It is certainly doubtful whether one would find anything approaching it amongst present-day tuners and receivers, not matter how pretentious their specifications in other modes — FM, mono or stereo, and as tape and phono amplifiers.

One basic reason has undoubtedly to do with the role of AM radio itself. In 1935, it was the prime source of sound entertainment in the home. There was no FM and no tape. Phono records spun at 78rpm and lasted for 3 or 4 minutes per side; they were relatively noisy and anything like a comprehensive library of home entertainment posed a serious problem in both storing and handling.

By contrast, radio programs on the AM broadcast band were accessible and varied in their content. They provided the main source of family entertainment and it was natural that there should be a consumer interest in more fully exploiting the medium — multiband coverage, good DX performance, variable selectivity for high quality local reception, and an ambitious audio system. Scott probably carried these themes as far as anybody catering on a substantial scale for the consumer market.

Nowadays it would be possible to parallel the Scott formula without having to strain technology to anything like the same relative limits. Multi-channel amplifiers featuring high power and low distortion, plus an array of signal tailoring facilities are the rule rather than the exception. Loudspeaker systems to match are in abundance.

Modern transistorised front ends offer signal/noise ratios that were unheard of in valve days, while circuit configurations like the Wadley-loop ensure an extremely high order of stability.

Variable selectivity still has its problems, but there is no way that a modern designer would need to approach the problem as Scott did, with multi-ganged trimmers modifying the

solar powered . . .

Measuring 72 x 98 x 17mm, this AM radio for personal headphone listening operates from internal rechargeable batteries, which can be re-energised from its in-built solar cell. The solar cell can power the radio on its own in daylight or even from the light from a 100W lamp. In total darkness, the batteries will operate the receiver for 100 hours on a full charge. The price is quoted as $74.95. (Details from National Panasonic (Australia) Pty Ltd, 57-69 Anzac Parade, Kensington 2033).

DIRECT-DRIVE TURNTABLES HAVE THEIR OWN PROBLEMS

The new Philips AF 877 "Direct Control" turntable employs belt drive but uses an electronic tachometer to control the speed of the actual platter. All the facilities expected of a quality player are provided.

Direct-drive turntables have a lot going for them — provided the manufacturer has not cut too many corners in an effort to achieve a bargain basement price. According to Arno Rieuwers, hifi product manager for Philips, a belt-drive unit may well turn out to be a better performer on a price-for-price basis.

Says Mr Rieuvers: "When direct drive came on to the scene several years ago, the industry fell in love with it, expensive as it was.

"The buyer may automatically think that direct-drive performs better than belt-drive in every case.

"But what happened when manufacturers tried to lower the cost of direct-drive motor systems for their cheaper models?" asked Mr Rieuvers.

"Audio experts are now on the lookout for a flaw in low cost direct-drive motors known as "cogging". This is a vibration as the motor is pulled in steps from pole to pole.

"It should be known that, at equivalent prices, even conventional belt-drive can out-perform direct-drive, and the newer direct control system can be far superior again.

"Manufacturers are turning their attention back to the precision belt-drive systems when they realise that these can bring better performance at lower cost. Direct-drive is being reserved for the top-end models in which only the highest quality direct-drive motors can be justified by the price."

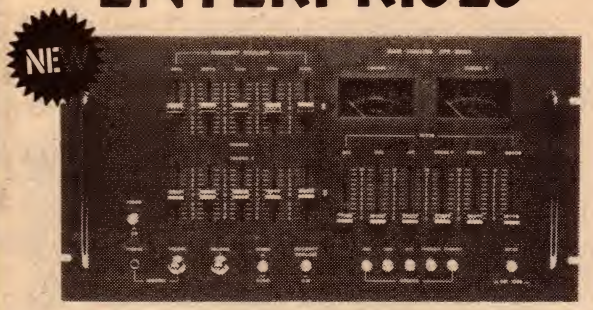
Two new turntables recently introduced into Australia by Philips are precision belt-drive units. Designated as AF 777 and AF 877 models, they are rated to have a rumble level of —70dB (DIN B) and a wow and flutter figure of 0.025% WRMS.

Philips describe them as having a "direct control" feature. An electronic tachometer under the platter constantly monitors platter speed and compares it with a standard reference signal. If the platter speed varies for any reason at all — mains voltage, temperature, stylus drag, &ETC — the speed of the drive motor is compensated instantly.

By varying the reference signal, the user can change the speed of the turntable by a small amount relative to 33 or 45 rpm. In the case of the AF 877, a bar of LED indicators indicate the degree of plus or minus adjustment of the "pitch" control.

Another point of note about the turntables is that they are fitted with a straight tonearm and offset head, rather than the more usual S-shaped tonearm. As Mr Rieuwers correctly points out, the tracking characteristics of a pickup are set by the actual distance between the stylus and the pivot, and by the angle of head offset. The shape of the arm in between has no bearing on the tracking.

CASH-MORE ENTERPRISES



CASHMORE'S HAVE DONE IT AGAIN.

"BRAND NEW DISCO MIXER" STEREO
WITH * TWIN VU METERS
* 5 BAND GRAPHIC EQ PE CHANNEL 40H2 to 16KH2
* FULL MONITORING FACILITIES
* RACK MOUNTED
INPUTS = AUX - TAPE - MIC - PHONO 1 - 2

CARTRIDGE TAPE STEREO ECHO MXR
* 2 MIC INPUTS
* 2 LINE INPUTS
IDEAL FOR GUITARISTS, VOCALS OR BOTH

CASH-MORE'S AUSTRALIA'S LEADING SUPPLIER OF DISCOTHEQUE EFFECT LIGHTING AND SOUND SYSTEMS

SALE — HIRE — LEASE — INSTALLATIONS

● ILLUMINATED DANCE FLOORS ● CHASERS ● FOG MACHINES — MIXERS ● ROPE LIGHTS ● PROJECTORS + WHEELS ● MIRROR BALLS ● POWER AMPS ● STROBES ● SPACE BEACONS ● MONSTER FUZZ LITES, ETC.

356 LIVERPOOL ROAD, ASHFIELD NSW 2131
PHONE: (02) 798 6782, 798 5647, 797 7022
TELEX: 27732

FREE BROCHURES ON REQUEST

HIFI TOPICS — continued

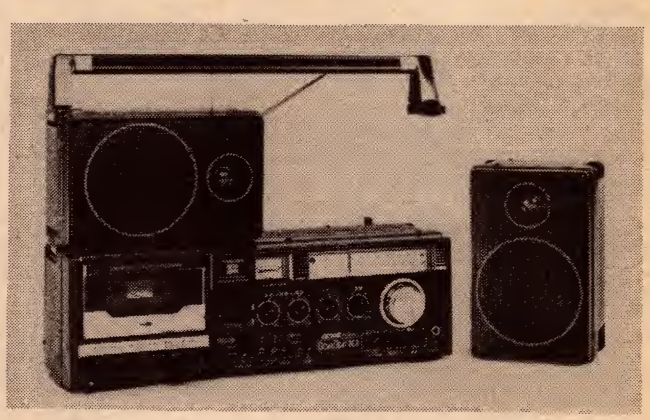
resonance and coupling inside a whole string of IF transformers. A modern designer would more likely switch ceramic filters or even complete alternative IF channels.

But the fact is that sophisticated front-end design is confined almost exclusively to communications style receivers which have very unpretentious audio systems. By contrast, the AM tuners provided in elaborate hifi systems are almost invariably of routine design. The inference clearly is that even those who are prepared to outlay large sums for high quality stereo via disc, tape and FM present no indentifiable demand for quality via AM — at least for the time being.

With an eye to their fading popularity, AM stations, particularly in America, would like to get into stereo and hopefully encourage a new generation of better quality AM tuners — but whether it will come about remains to be seen!

COMPLETE AUDIO SYSTEMS of Melbourne is currently importing and distributing Mission Electronics Products from Cambridge, UK. Included in the range are hifi loudpseakers rated from 15W to 150W, amplifiers capable of up to 150W per channel, pickup arm, cartridge and sundry record care equipment. Complete Audio Systems also handle Swiss-made Neutrik audio plugs, available in three and five-pin male and female combinations, with silver and gold plated contacts. Again, they list preamplifiers and a range of record care gear from Jeremiah Braithwaite. For further information, contact Richard Lightfoot, Complete Audio Systems, 175 McKean St, North Fitzroy 3068. Telephone A/H (03) 48 5317.

PLESSEY AUSTRALIA have expanded their domestic range to include a miniature two-way system developed in Japan by Foster Electric. Designated as PF100, it uses a 100mm main driver and a 25mm dome tweeter, mounted in a black metal enclosure with a perforated metal grille. Overall size is 100mm x 100mm x 180mm high. Efficiency is said to be high, making the units a good choice for home extension speakers, caravans, boats, etc. Frequency response is rated as 80-22000Hz. Supplied complete with mounting screws and attachable feet, they will retail for about $150 per pair. Trade inquiries to: Components Division, Plessey Australia Pty Ltd, Chrstina Rd, Villawood 2163.



Looking more like an electronic instrument that a portable radio, the new Toshiba RT-8740S combines a sensitive receiver for FM/stereo, AM and shortwave, with a cassette recorder with Fe/Cr switching, auto stop/sleep, mic inputs, sound mixing, tape counter and bass and treble controls. The two-way loudspeaker systems are detachable so that the unit can be used either as an integrated portable or as a full stereo system, indoors or out-of-doors. Operation is from the power mains or internal batteries. The RT-8740S is available from authorised Toshiba dealers throughout Australia.

During the current year, Audio Telex Communications Pty Ltd plan to establish cassette instant copy facilities in University bookshops, libraries, conference centres, etc. The customer will purchase a copying cassette — 34, 64 or 124 minutes — having extra tape to ensure that it will cope with any source cassette. The Telex high speed copier will then transfer both tracks simultaneously. Total cost of cassette and copying for the times listed above will be $2.25, $2.89 and $4.88.

PLESSEY AUSTRALIA, who distribute speakers made by Foster Electric of Japan, announce three new models intended primarily for use with musical instruments or P.A. systems. All feature die-cast baskets and lightweight but rigid cones, and all are available in either 8 or 15 ohms.

The K61 has a diameter of 380mm and is a good choice for electric basses, etc. It offers a sound pressure level (SPL) of 101dB and a power handling capability of 180W. It is fitted with an 80mm voice coil, and has a rated response of 40-4000Hz.

For lead and rhythm guitars, organs, keyboards and P.A., the 300mm K60 offers an SPL of 99dB, a power handling capability of 150W, a voice coil diameter of 65mm and a rated response of 60-5000Hz. The larger 380mm K60 is rated for an SPL of 101dB, a power handling capacity of 180W, and a response of 40-4500Hz.

The new drivers are available through Plessey in Sydney and Melbourne, and through distributors in other centres.

BASF AUSTRALIA LTD claim that the best results currently available to cassette enthusiasts follow the use of a high quality deck, with switching for Cr02 (chromium) tape, used in conjunction with BASF's Chromdioxid super cassettes. Their FeCr two-layer tapes are also capable of top quality results but perform to best advantage when the deck has a third position on the bias/compensation switching. Notwithstanding this remark, it may be well wortwhile to try an FeCr tape on decks which are intended only for normal ferric tape. Under these conditions, FeCr tape will tend to exaggerate the top end response but this may be a welcome boost for some decks, particularly older types with limited top-end response. For further information: Mr Nigel Price, BASF Aust Ltd, 55 Flemington Rd, North Melbourne 3051.

DBX LIMITED of Boston, USA, has recently become a subsidiary of BSR Ltd, as a result of an $8 million deal with BSR (USA) Ltd. DBX specialises in high-end consumer, semi-professional and professional audio equipment, in particular tape noise reduction systems and dynamic range expanders. Present management will continue to be responsible for the administration of the Company and the two principal shareholders have signed contracts of service covering a minimum period of two years.

DICK SMITH ELECTRONICS have been shouting out loud what many others have been saying for quite a while in a more restrained manner: Hifi equipment (and other items) bought overseas may appear to be a bargain but it is all too easy to end up with a model which is not sold in Australia and for which no service or spare parts are readily available. Further, not all Australian distributors are required to honour warranties on equipment that they have not, themselves, imported and sold. Worse than that, some of the official looking warranty cards packed with super bargains could be fakes. Dick Smith has a special reason for saying all this because he is opening his own store in the Kowloon district of Hong Kong, with a special eye to the needs of Australian tourists. Even if he can't compete with the "back-door" specialists, he is confident that he will be able to offer prices well below Australian-based duty-free stores and, at the same time, offer warranty and service on all such equipment when it is brought back into Australia.

ZEPHYR PRODUCTS of 70 Batesford Rd, Chadstone 3148 have added a Real Time Spectrum Analyser, designated AF-SA1, to the range of loudspeakers, amplifiers and microphones manufactured in Italy by RCF. The AF-SA1 covers a frequency range of 40-16,000Hz in 27 third-octave steps. The display involves 12 LEDs per channel, with a total dynamic display of +3dB to —20dB. Microphone and line outputs are provided, with built-in attenuation of line level, together with a controllable pink noise generator. The unit is supplied in a 19in rack format with quarter-inch jacks for inputs and outputs. Recommended retail price, with pink noise generator and display is $2300.00. A suitable microphone would be extra.

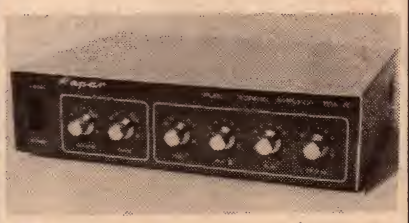
Rapar

PUBLIC ADDRESS AMPLIFIERS YOU CAN DEPEND ON

TPA 50

Specs.
RMS power, 25 watts. Frequency response: 50Hz to 15kHz (+3dB at 8 ohms). Multiple outputs: 4, 8 and 16 ohms. 70 and 100 volt lines. Inputs: Mic. 1, 47k ohms, Mic. 2, 600 ohms. Aux. 300mV, Phone 2.5mV.
Size: 310mm (width), 230mm (depth), 80mm (height). Weight 3.8 kilos. Finish: Durable two-tone baked enamel.

***$146.97**



MODEL TPA 70

Specs.
RMS power, 50 watts. Frequency response: 50Hz to 15kHz (+3dB at 8 ohms). Multiple outputs: 4, 8, 16 ohms, 70 and 100 volt lines. Inputs: Mic. 1, 47k ohms, Mic. 2, 600 ohms, Aux. 300mV, Phone 2.5mV.
Size: 310mm (width), 230mm (depth), 80mm (height). Weight: 4.3 kilos. Finish: Durable two-tone baked enamel.

***$182.50**

TRADE AND DISTRIBUTOR ENQUIRIES WELCOME

MANUFACTURED BY:

RADIO PARTS GROUP

562 SPENCER STREET, WEST MELBOURNE, VIC. 3003. TEL. (03) 329-7888.

1103 DANDENONG ROAD, EAST MALVERN, VIC. 3145. TEL. (03) 211-8122.

Ten Reasons Why Memorex Cassettes Are Superior . . .

1 Welded cassette halves add strength and dimensional stability compared to screw-joined cassettes.

2 The special Memorex wafer resists static electricity and reduces friction.

3 Memorex cassette halves are constructed of high impact, heat resistant polyestyrene plastic which will not warp in temperatures up to 56°C. (132°F.).

4 Precise molding of the hub provides a true circumference in the tape pack. There is no bump to cause wow or flutter.

5 The memorex large window (an exclusive Memorex feature) makes it easier to determine position and when it's time to change sides.

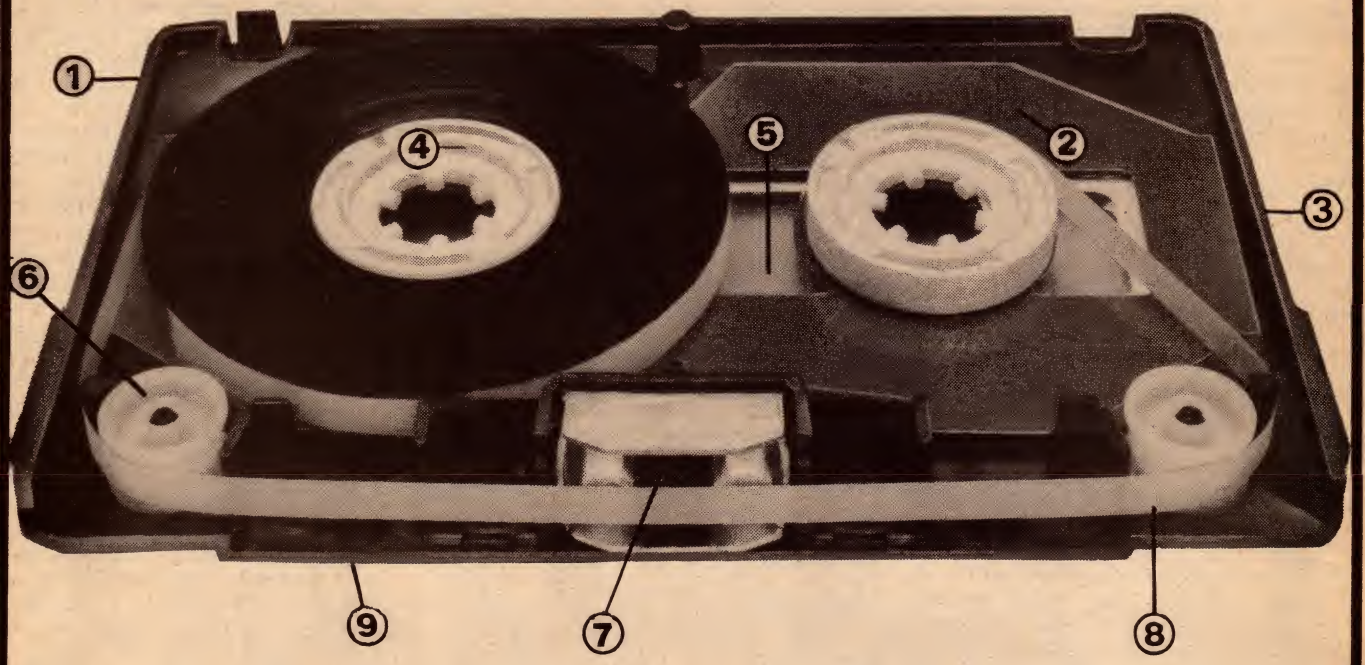
6 Large flanged rollers add extra surface contact for guiding tape. This minimizes jamming, tape wow and flutter during play, record and rewind.

7 An extra-large pressure pad provides optimum tape-to-head contact and lasts longer than smaller pads.

8 No stationary cassette parts come in contact with the tape oxide during recording or rewind. This prevents oxide damage from abrasion.

9 There is no seam along the tape path in the front, as in other cassettes. This minimizes the possibility of tape oxide wear and prevents the tape from slipping out of the cassette or snagging.

10 Each Memorex cassette comes with a written warranty. If you find a Memorex cassette defective in materials or workmanship, return the cassette prepaid to Memorex and it will be replaced without charge.



MEMOREX NEW MRX3

AVAILABLE IN C45 C60 C90 AND THE NEW C120 SIZES

Sole Australian Distributor for Audio-Technica Products

MAURICE CHAPMAN AUSTRALIA PTY LTD

44 Dickson Avenue,
Artarmon, NSW 2064
Phone: 438-3111

150 Burwood Road,
Hawthorn, VIC. 3122
Phone: 818-1730

29 Kooringal Drive,
Jindalee, QLD 4074
Phone: 376-3931

BURMAC ENTERPRISES PTY LTD

114 Railway Pde, West Perth, W.A. 6005. Phone: 3218-346

AUDIO TALK

by LEO SIMPSON

Loudspeaker cables and their mythology

In the last couple of years or so, there have been quite a number of new products and new product features which have been introduced to the high fidelity market. Some of these have been worthwhile, but others have been of quite dubious benefit. Into the latter category must be placed the new special cables for loudspeaker connection.

A few years ago a set of these cables was submitted to us for review. The claims made for the cables made us shake our heads in amused disbelief, and we rejected the product for review. In retrospect, it might have been better if we had reviewed them, for they could have been debunked there and then.

The proponents of these cables, mainly Japanese manufacturers, have started from the premise that conventional loudspeaker cables have inductance. From that premise, they go on to state that because inductance in a cable will attenuate high frequencies delivered to the load, then conventional loudspeaker cables are inadequate and cause poor definition in sound reproduction.

So the manufacturers have produced a variety of special cables which are claimed to have very low resistance and very low inductance. The advantages of the cables are documented in response curves which purport to show the typical high frequency attenuation of conventional cables and the improvement obtained with the manufacturer's cables.

In some cases, the manufacturers go so far as to quote the characteristic impedance of their cable. Typical figures quoted are in the region of 8 to 10 ohms. They go on to state that the characteristic impedance of the normal twin-leader (or figure-8 cable) used for connecting speakers is much higher and therefore, by implication, that twinlead produces a severe mismatch. This is absolute nonsense.

By quoting figures for characteristic impedance the manufacturers are suggesting that speaker cables act, or should act, as transmission lines, in much the same way as a length of 300-ohm TV ribbon does. In other words, the cable is supposed to act as a constant impedance system which matches its termination impedance and transfers signals over long distances with minimum losses and reflections.

Now it is a fact that the impedance of a loudspeaker system varies widely with frequency. For example, a typical two-way loudspeaker system with a nominal 8-ohm impedance may vary from 30 ohms at its fundamental resonance to less than 6 ohms at the cross-over frequency. Over the rest of the range, the impedance may be highly capacitive or inductive. So a loudspeaker represents a very poor termination for such a transmission line.

But the main reason for rejecting the transmission line concept is that it only applies where the length of line is many times greater than the wavelength of the signal concerned. The electrical wavelength of a 20kHz signal is no less than 15 kilometres. So anybody who considers that a loudspeaker cable acts like a transmission line is definitely on the wrong wavelength (pun intended).

Having rejected the transmission line concept out of hand, we decided to examine a typical set of these cables closely. We would measure them and make comparison tests with conventional cable. The pair we examined were of Japanese manufacture. Instead of the usual moulded "figure-8" cross-section, these special cables are of circular cross-section.

The circular cross-section is obtained by plaiting a large number of varnished conductors around a 6mm circular core of clear plastic. The plaited cable has an overall sheath of clear plastic which protects it. At each end of the cable are brought out to two separate conductors which can be connected to speakers and amplifier.

Presumably, the plaited construction cancels the self-inductance of the cable. We would expect the inductance to decrease by comparison with ordinary figure-8 cable, although the capacitance should also increase. The manufacturers of all these cables make no mention of the capacitance.

We were intrigued with the circular plaited construction of these cables and struck by the superficial similarity to the old Litzendraht wire used in radio frequency circuits. "Litz" wire, as it was more commonly called, was composed of a large number of finely interwoven conductors, each separately insulated. This method of construction was adopted to provide a large surface area for a given length and cross-section of conductor. The large surface area was desirable to combat Skin effect, which is the tendency of RF signals to travel near the surface of a conductor and thus increase the effective resistance.

Just in case any reader is wondering, Skin effect does not occur at audio frequencies. It would be interesting to know if anyone has been "conned" into buying these cables by just such an argument.

For what it is worth, other competing brands of these "super" cables have different construction. Some are plaited into a flat cable form, while others look like conventional shielded cable.

We decided to compare the round cable described above with a 10-metre length of 23/0.19mm figure-8. The specifications given for the "super"

TASMAN ELECTRONICS

12 Victoria Street, Coburg 3058. Phone (03) 354 5062

FOR TOP QUALITY COMPONENTS AT ROCK BOTTOM PRICES

Transistors & ICs, resistors, capacitors, transformers, switches, wire and cable, diodes, bridges, SCRs, triacs, audio and TV leads, plugs and sockets, power supplies & adaptors, stylii, DMMs, calculators, instrument cases and boxes, knobs, heat sinks, fuses, cassettes, batteries, TV antennas, musical instruments and accessories, etc, etc.

We are also dealers for "AIWA" quality hi-fi products.

cable were as follows: Length 6 metres; DC Resistance .0105 ohm/metre; Inductance 0.15uH/metre; Characteristic Impedance 9.15 ohms.

We tested the two cables by measuring their insertion loss when driving an 8-0hm resistive load and also a typical two-way bass reflex loudspeaker system. The figures are taken at four frequencies as tabulated below.

8-ohm resistive load:

	Super cable	twin 23/0.19mm
100Hz	—0.15dB	—0.5dB
1kHz	—0.15dB	—0.5dB
10kHz	—0.15dB	—0.6dB
100kHz	—0.1dB	—2dB

The results for the 8-ohm resistive load are interesting for a number of reasons. First, the insertion loss of 0.15dB for the super cable suggests that it has a total resistance which is about twice that calculated by multiplying its length by its quoted resistance per unit length. (The reduced insertion loss at 100kHz is probably due to inductance in our dummy load resistors.)

Second, the results for the 23/0.19mm figure-8 cable are as expected from calculations. Its total resistance is approximately 0.5 ohms, which should produce an insertion loss of 0.5dB at audio frequencies with an 8-ohm load. Notice that it only suffers by comparison with the super cable at 100kHz, where the insertion loss is 2dB. Maybe some music containing these frequencies has been composed for dolphins and bats, but I have not heard of it.

When used to drive a loudspeaker system the results were as tabulated below:

	Super cable	Twin 23/0.19mm
100Hz	—0.05dB	—0.15dB
1kHz	—0.25dB	—0.7dB
10kHz	—0.25dB	—1.0dB
100kHz	—0.1dB	—1.6dB

Here the effect of the widely varying impedance of the loudspeaker system is evident. At 100Hz, its impedance is high due to a bass resonance effect, so the insertion loss of both cables is low. At other frequencies within the audible range, the disadvantages of the figure-8 cable is less than 1dB — which is negligible. Note also that any non-linearity in the frequency response caused by the speaker leads is minor compared to the overall non-linearity of the speaker itself.

We also made comparisons of both cables feeding a 10kHz square wave to the same loudspeaker. We found the deterioration produced by the figure-8 cable so similar to that of the super cable as to be virtually impossible to distinguish from oscilloscope patterns, and it was not worth taking pictures. And oscilloscope traces of the tweeter output when driven with a 5kHz square wave via either cable were virtually identical in waveform and only slightly different in amplitude.

This is not surprising. After all, a typical tweeter can only handle the fundamental, third harmonic and fifth harmonic of a 5KHz square wave. The end result does not look much like a square wave! So any talk about the high frequency attenuation of conventional loudspeaker cable is largely academic. The one advantage of the "super" cable is that it has a very low DC resistance.

Low DC resistance is important in speaker cables. It enables the amplifier to provide maximum damping effect for the loudspeaker and thus helps ensure clean bass and lower-middle frequency reproduction. For this to occur, the DC resistance of the cable should be no more than 0.5 ohms. This would explain the improvement in clarity obtained by some users of the super cables — many of these users previously had higher resistance speaker cables.

But there is one parameter of the super cables that the manufacturers conveniently neglect to mention. That is capacitance. We said before that capacitance would be higher than for conventional cables, but we were surprised to obtain the figure for a 6 metre length of cable: no less than 0.01uF! Now this is in the range of load capacitance for which some amplifiers are at least marginally unstable at supersonic frequencies.

At a low level, supersonic oscillation can give a subtle "edge" to the sound quality. At high levels, supersonic oscillation can cause quite unpleasant sound quality as well as amplifier overheating and possible failure. We have a well-known and respected American power amplifier which we know to be very slightly unstable with capacitances in the range of .0033uF to 0.01uF. Sure enough, when we tested with the super cable, it became unstable. Enough said!

There is really only one conclusion to be drawn from all this: Low resistance speaker cables are desirable, but the new super cables are not the way to go. Apart from their extortionate cost at more than $30 for a pair of 6 metre cables, they can cause problems with your amplifier due to the significantly increased capacitance.

A better way to ensure that your loudspeaker leads have low resistance is to use 23/.019mm figure-8 flex, or heavier cables. Unfortunately heavier cables are not really readily available, although they are manufactured for the automotive trade in large quantities. "4mm auto cable" which is readily available from auto accessory stores is eminently suitable, although it is necessary to purchase four lengths to make up a pair of cables, for two loudspeakers.

Alternatively, contact Audiosound Electronic Services, of 148 Pitt Road, North Curl Curl, NSW 2099. They stock a range of heavy gauge figure-8 flex for use as speaker cable.

"Measurements aside, Bruce, these new special loudspeaker cables really do make a difference".

COMPUTERS ARE FUN

THE ULTIMATE PROGRAMMABLE VIDEO COMPUTER SYSTEM BY ATARI

AS SEEN AT THE MELBOURNE HOME COMPUTER SHOW

You will be able to play rousing, challenging, sophisticated video games with the option of 20 additional great game program cartridges which offer up to 50 games and variations per cartridge. Game program cartridges available are: Breakout, Outlaw, Slot Racers, Air-Sea Battle, Indy 500, Space War, Street Racer, Home Run, Starship, Basketball, Video Olympics, Codebreaker, Flag Capture, Surround, Hunt and Score, Blackjack, Basic Maths, Brain Games, Hangman. The Atari video computer system comes complete with the Combat game program cartridge with 27 thrilling games and variations; interchangeable joysticks and paddle controllers with difficulty option switches so the games get better as you get better with crisp bright colour and incredible true-to-life sound effects coming from your TV's speaker; special circuits to protect your TV; the now famous Futuretronics three months warranty and especially the famous Atari quality. Your Atari video computer system is as up-to-date next year as it is today, you simply insert new game program cartridges as they become available to assure you of years of fun and enjoyment.

NOW DUTY FREE	*$339.00*
EXTRA CARTRIDGES	*$ 33.90*
KEYBOARD CONTROLLERS (REQD FOR BRAIN GAMES, CODEBREAKER AND HUNT AND SCORE)	*$ 26.00*
INDY 500 CONTROLLERS	*$ 26.00*

ATARI®
Innovative leisure
A Warner Communications Company

The complete home entertainment centre. Connects to any TV set in seconds, does not damage your TV. Special circuitry changes colour every 10 seconds to avoid image burn in. Atari — more games per cartridge, more realism, more fun than any other programmable TV game available. If you are not yet convinced that you are looking at the best video computer system, send away for our free, full colour, 24 page Atari catalog and see for yourself. Computers are fun, bring excitement into entertainment.

DELIVERED FREE BY REGISTERED POST ANYWHERE IN AUSTRALIA. SEND ORDER TO: COMPUTERS ARE FUN, PO BOX 382, CHELTENHAM, VIC. 3192

ORDER FORM: Please Print

Enclosed is my cheque/postal order for $.....

Please forward ATARI video computer system ☐ Free catalog ☐

EXTRA CARTRIDGE AS INDICATED ☐ Insert number of cartridges

NAME .....

ADDRESS .....

..... POSTCODE.....

EXTRA CARTRIDGES

BREAKOUT	☐
OUTLAW	☐
SLOT RACERS	☐
AIR-SEA BATTLE	☐
INDY 500	☐
SPACE WAR	☐
STREET RACER	☐
HOME RUN	☐
STARSHIP	☐
BASKETBALL	☐
VIDEO OLYMPICS	☐
CODEBREAKER	☐
FLAG CAPTURE	☐
SURROUND	☐
HUNT AND SCORE	☐
BLACKJACK	☐
BASIC MATHS	☐
BRAIN GAMES	☐
HANGMAN	☐
KEYBOARD CONTROLLERS	☐
INDY 500 CONTROLLERS	☐

Audio-technica AT12XE/H magnetic cartridge & headshell

The Audio-technica AT12XE/H is one of a range of 11 moving-magnet cartridges produced by this Japanese manufacturer. The AT12XE/H has an elliptical stylus, and is supplied fitted into a standard headshell. Recommend tracking force range is 1 to 1.75 grams.

The Audio-technica AT12XE/H cartridge is supplied in simple packing, which is a change from the expensive and useless packaging which was common a few years ago. As a bonus, the cartridge is supplied in ready to use form. It is fitted in a headshell which mates with the standard EIA locking collar, standard colour-coded leads, slotted mounting holes and a finger-lift.

We are very much in favour of this method of selling cartridges. Instead of having to go through the fiddly process of mounting the cartridge in a separately purchased headshell, all the user has to do is to adjust the cartridge for optimum stylus overhang and alignment, balance the arm and set the tracking force. This is done in a few moments and then the music can go round and around.

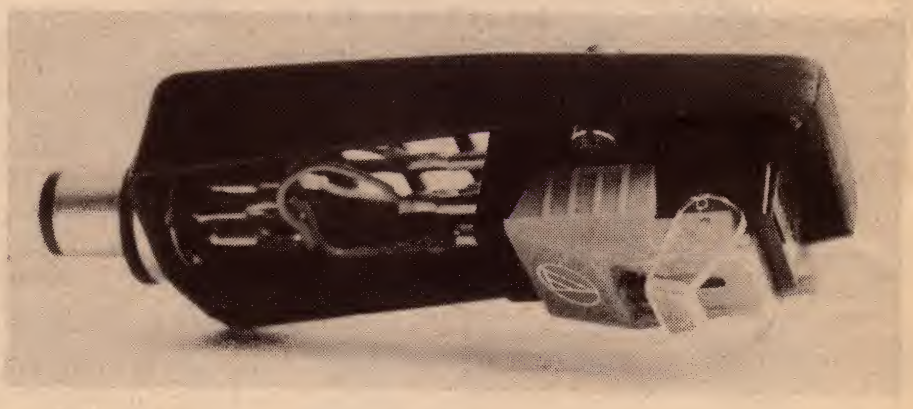
While superficially similar to many other cartridges, the AT12XE/H has a number of different features. Audio-technica apply the moving-magnet principle in their patented dual-magnet system. Two very small magnet arms are attached to the stylus cantilever and mounted at 45 degree angles, ie, effectively perpendicular to the groove walls.

The dual-magnet system results in a removeable stylus assembly which is pulled straight down and slightly back to remove it, rather than being pulled out along the major axis of the cartridge as in competitive brands.

Integrated with the removeable stylus assembly is a flip-down stylus cover which is more useful than detachable covers which are liable to be misplaced. However, we think that the click-stops for the flip-down cover should be made more positive to provide more protection.

The stylus is elliptical, 18 x 8 microns, with an effective tip mass of 0.4 milligrams and the standard (EIA/DIN) vertical tracking angle of 20 degrees. Inductance of the cartridge is 670 millihenries and resistance is 1200 ohms. Recommended load is 47k with shunt capacitance not specified.

We found one small problem when we fitted the cartridge/headshell to a typical tone-arm: the headshell bayonet fitting was slightly askew, which resulted in incorrect alignment of the cartridge with respect to the record surface. This problem can be solved in several ways. One is to use the small screw adjustment on the collar of many arms — although this is impractical if the user wishes to be able to quickly interchange cartridges. Another method is to pack up one side of the cartridge. Needless to say it is better to make sure you get a good headshell in the first place.



An optional Audio-technica accessory to suit enthusiasts with more than one cartridge mounted in headshells is the AT-6003, which stores up to three extra cartridges under plastic domes. This attractive accessory suits most plug-in headshells.

We used the manufacturer's maximum recommended tracking force of 1.75 grams and this gave very good tracking performance. On the CBS STR 110 test disc, it handled all the high-level 300Hz tracks without audible distress, although the +18dB lateral track resulted in visible distortion of the output waveform.

On the W&G 25/2434 test/disc, it handled the +16dB drum track with no problems. A similarly encouraging result of good tracking emerged on the Shure "Audio Obstacle Course".

We tested the cartridge with the recommended load of 47k, shunted by cable and test instrument input capacitance of 180pF. The frequency response obtained was very smooth and within ±2dB from 20Hz to 18kHz and -5dB down at 20kHz. Channel balance was within 0.5dB over most of the range.

Separation was uniformly wide over the whole audio range. Audio-technica specify it as 24dB at 1kHz and 18dB at 10kHz. We measured it as 20.5dB at 1kHz in one direction and 31dB in the other. At 10kHz the respective figures were 18dB and 22dB. Even at 20kHz, the figures were 15dB and 17.5dB.

Square wave response of the cartridge at 1kHz was good, as was the waveform for sinewave signals. Even the common tendency for waveform to become a sawtooth in the region from about 8kHz to 14kHz was only slight.

On listening tests the AT12XE/H performs very well and confirms the high performance indicated by the measurements. There is perhaps a slight tendency to emphasise the upper treble, but this effect can be easily compensated for by a slight touch to the treble tone control.

Our overall impression of the AT12XE/H is favourable. It is a good performer which is supplied in a ready-to-use form, in the headshell. Recommended retail price is $42.95. Further information on Audio-technica products can be obtained from high fidelity retailers or from the distributors, Maurice Chapman Australia Pty Ltd, 44 Dickson Avenue, Artarmon, NSW 2064. (L.D.S.)

TANDY ELECTRONICS

CB Radios & Accessories

Sale Ends 28th April, 1979

Deluxe Mobile AM with LED Channel Readout

79.95

Regular Retail Price **109.95**

Specifications

Sensitivity for 10 dB S + N/N: 0.5uV. **Adjacent Channel Rejection:** 70 dB. **Audio Power Output:** 4 watts maximum (10% THD). **RF Power Output:** 4 watts maximum. **Power Requirements:** 12 VDC positive or negative ground. **Size:** 5.5x15.8 x22.8cm.

Realistic TRC-469. Feature packed for outstanding performance! PLL synthesizer gives top frequency stability on all 18 channels. Switchable ANL eliminates or reduces interference from faulty ignition systems. Flip the 3-way PA/Monitor/CB switch to "monitor" and it functions as a PA system while continuing to receive CB calls! Comes with plug-in dynamic mike, universal mounting bracket and DC power cables. Suitable for any 12 VDC positive or negative ground vehicle or boat. 21-9469

Budget-Priced Mobile With Noise Blanker and RF Gain Control

169.95

Regular Retail Price **229.95**

Specifications

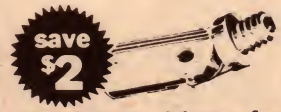
Sensitivity for 10 dB S + N/N: SSB, 0.5uV; AM, 1.0 uV. **Adjacent Channel Selectivity at 10 kHz:** 60 dB. **Image Rejection:** 50 dB. **Clarifier Range:** ± 600 Hz, variable. **Audio Output:** 4 watts. **RF Power Output:** 12 watts P.E.P. SSB maximum; 4 watts AM maximum. **Power Requirement:** 12VDC positive or negative ground. **Size:** 6.0x20.3x26.0cm.

Realistic TRC-448. Loaded with many boastful features. PLL circuitry, clarifier for fine-tuning SSB reception, dual IF's and a crystal/ ceramic filter for superb selectivity. Noise blanker cuts impulse interference. There is a volume/RF gain control, squelch, switch for AM/LSB/USB mode selection, LED channel indicator, and illuminated S/RF meter. With mobile bracket, push-to-talk mike, DC power cord with inline fuse. 21-9448

Regulated CB Power Supply

39.95 Regular Retail Price **46.95**

For all CB's including SSB, 13.8 VDC regulated output at 2.5 amps continuous, 5 amps, surge. 22-9124



Mobile Angle Adaptor for Base-Loaded Antennas

3.95 Regular Retail Price **5.95**

For hatchback or other slanted-trunk cars. Mounts between whip and spring, adjusts 180° to keep whip vertical. 21-956

Alternator Noise Filter

1.99 Regular Retail Price **3.95**

Stops receiver "whine" produced by alternator. For units with external regulator. 21-507

Mobile Antenna Matcher

9.95 Regular Retail Price **12.95**

Reduces SWR. Matches any impedance. 10 to 1000 ohms. 21-924

Retractable CB/FM/AM Antenna

39.95

Regular Retail Price **59.95**

Flip switch-antenna automatically disappears into fender. Features a centre-loading coil for finest performance, and a splitter to isolate FM/AM signals from CB signals. Adjustable SWR. Overall extended antenna length 86.3cm. With 6.0cm cable and splitter, hardware, instructions. For 12VDC neg. gnd. 21-971

Stainless Steel Body Mount

26.95

Regular Retail Price **32.95**

259 cm stainless steel whip with swivel ball mount, insulator and heavy back-up plate for easy mounting. Shock spring is triple chrome-plated. Overall length, 274.3cm. Lug terminal connections. Less cable. 21-1094

Roof-Mount Antenna

26.95

Regular Retail Price **32.95**

Whip adjusts for lowest SWR and maximum RF output. 3/8" snap-in for easy installation, solderless connections. With 4.8m coax cable and connector. 21-904

Available from Tandy Electronics & Participating Dealers
Mail Order to: Tandy Electronics, P.O. Box 229, Rydalmere, NSW, 2116.

CMOS Die has LED display

Here's a particularly elegant electronic die design which uses CMOS circuitry for long battery life. It also features automatic turn-off after each "throw" is displayed. The readout is via a seven-LED display very similar to that of a normal die.

by DAVID EDWARDS

Even with the inroads television has made, games of skill and luck, where the element of chance is provided by a die or pair of dice are still among the most popular family recreations. However, many arguments have been caused by the penchant for normal dice to give apparently biased or ambiguous answers, particularly when the fever of the game is high.

In an effort to provide an attractive way of overcoming these problems, we have developed a new solid state die. As you can see from the photographs the unit is mounted in a small plastic box, fitted with a red perspex lid, upon which is mounted a single momentary contact switch. Batteries are utilised as the power source, making the device both fully portable and safe to use.

Each press of the switch provides the equivalent of a single "throw" of a normal die. When the switch is first pressed, an array of seven LEDs is illuminated, and flashes at random. After approximately two seconds, the display stabilises, showing a number from one to six as a pattern of lit LEDs, as would normally appear on the upper face of a die.

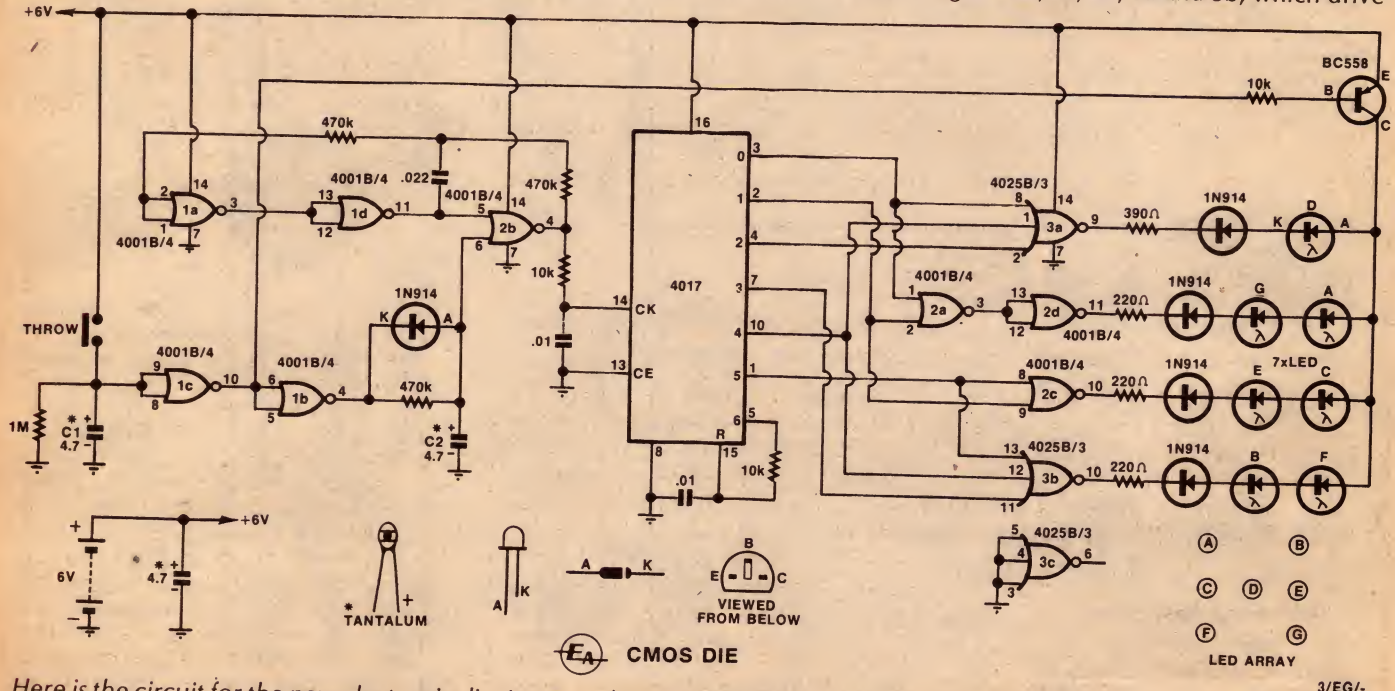
As long as the button is held depressed, the display will remain lit, and it will only disappear five seconds after the button is released. This means that if the switch is only operated momentarily, the display will flash for two seconds, stabilise for three seconds, and then disappear again.

No separate ON/OFF switch is provided, as the quiescent current drain of the unit is less than 50uA. The battery life is thus essentially the normal shelf life. When the display is activated, current consumption rises to about 20mA, but as this normally only occurs in five second bursts, battery life is not unduly prejudiced.

Our estimate, at the time of writing, of the total cost of the components required is only about $16.00. Even inexperienced constructors should be able to build the unit, as all components are mounted on a single circuit board. The battery is clamped beneath the circuit board, which is supported on threaded pillars.

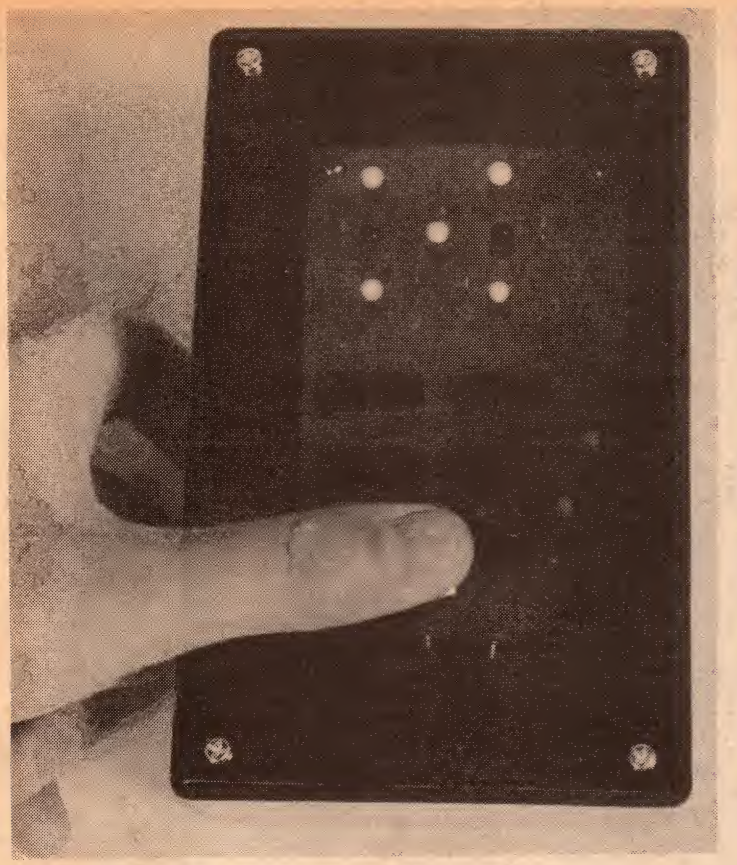
Turning now to the circuit diagram, we can discuss the operation of the unit in greater detail. Gates 1a, 1d and 2b are connected as a gated oscillator whose operating frequency is 50Hz. The oscillator supplies clock pulses to a 4017 decade counter, which is arranged by means of the RC network on the reset pin to function as a divide by six counter.

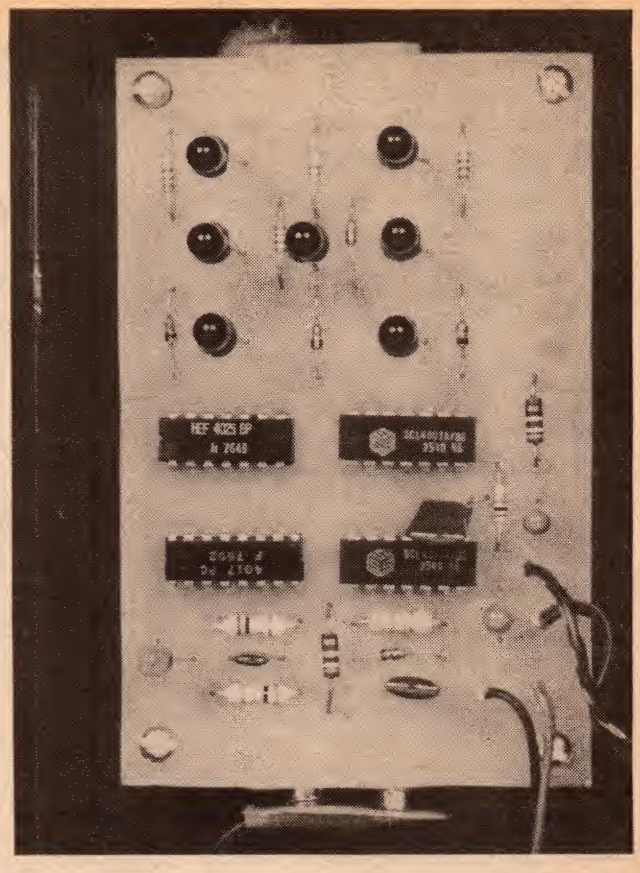
The six counter states are decoded by gates 2a, 2c, 2d, 3a and 3b, which drive



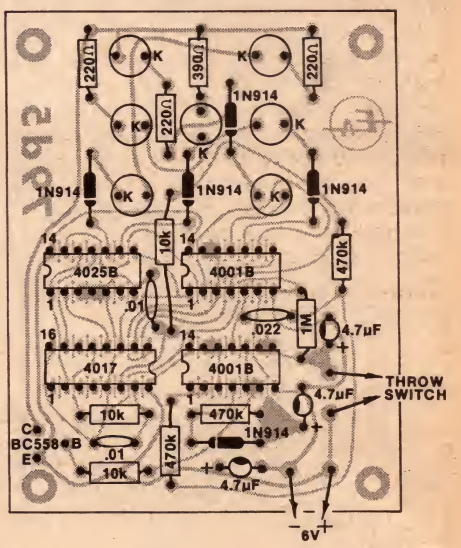
Here is the circuit for the new electronic die. It uses only four CMOS ICs, together with a transistor and seven LEDs. No on-off switch is required, as the circuit automatically reverts to a low-current quiescent state a short time after each throw.

3/EG/-





Above is a view of the completed die in operation; its display is very similar to a conventional die. At above right is a close-up of the PC board (or more accurately, an early prototype which was slightly different). At right is the final PCB overlay, showing all parts.



the four LED strings. The LEDs are arranged in the pattern shown, and a little thought will show that they can be divided into four groups (D, C & E, A & G, F & B), which can be combined together so as to produce displays having from one to six LEDs alight.

Illumination of the display is controlled by the BC558 transistor. This is normally held in the off state by the output of gate 1c. The 1N914 diodes in series with the LEDs are to prevent reverse voltages from being applied to the LEDs. Current limiting resistors are provided also, to set the LEDcurrent at 8mA.

Control of both the oscillator and the display is achieved by gates 1c and 1b. In the quiescent state, ie, when the throw button is not pressed, the oscillator is enabled by gate 1b, and the display is disabled by gate 1c.

When the throw button is pressed, capacitor C1 is charged immediately. This forces the output of gate 1c to change state, and this enables the display. The output of gate 1b also changes state, and C2 commences to charge via the 470k resistor. The 1N914 diode is reverse biased at this stage.

After about two seconds, the voltage on C2 reaches the threshold of gate 2b. This forces the output of gate 2b low, and disables the oscillator. The 4017 counter stops at a random count, and this is shown by the display.

This state of affairs continues for as long as the throw button remains depressed. When it is released, C1 commences to discharge via the 1M resistor. After about five seconds, the gate threshold is reached, and the gate changes state. This turns off the display, and also discharges C2, via the diode.

THE PARTS YOU'LL NEED . . .

SEMICONDUCTORS
- *2 4001B buffered CMOS NOR gates*
- *1 4017 CMOS decade counter*
- *1 4025B buffered CMOS NOR gate*
- *1 BC558 or similar PNP transistor*
- *5 1N914 or similar silicon diodes*
- *7 red LEDs*

RESISTORS AND CAPACITORS
- *1 1M, 3 470k, 3 10k, 1 390 ohm, 3 220 ohm*
- *3 4.7uF tantalum electrolytics*
- *1 0.022uF polyester*
- *2 0.01uF polyester*

MISCELLANEOUS
- *1 printed circuit board, coded 79d5, 91 x 71mm*
- *1 momentary contact pushbutton switch*
- *1 Zippy box, 95 x 50 x 160mm*
- *1 piece red perspex, 153 x 90mm*
- *4 19mm tapped spacers, with machine screws to suit*
- *4 AA cells, with holder to suite*

Solder, hookup wire, PCB pins, foam packing

NOTE: Resistor wattage ratings and capacitor voltage ratings are those used for our prototype. Components with higher ratings may generally be used provided they are physically compatible.

The Fabulous Sound of Direct-to-Disc and Digital Technology

Now available on the Sonic Arts and Telarc Labels

SONIC ARTS
Schumann Papillions, David Montgomery also Liszt and Chopin SA-LS 5

Four-handed Piano Rags, David Montgomery and Cecil Lytle, The Entertainer, Kitten on the Keys, seven others, SA-LS 6.

Woofers, Tweeters and All That Jazz. Jazz and sound effects, SA-LS7.

Vivaldi Tricentennial Ohmaya and The Cremona Chamber Ensemble. Opus 8 No. 1, Opus 2 No. 2, Opus 3 No. 11. SA-LS 8.

The Joy of Mozart G. Cleve and Mozart Festival Orch. Symphony No. 36, Divertimento for Strings SA-LS 9.

TELARC DIRECT TO DISC
The Great Organ at Methuen, Michael Murray, Widor, Vierne, Dupre, etc. TEL 5036.
Nov. '78 Audio Magazine says — "the biggest, shiniest, fattest organ sound in a long time, ultra-clean and beautifully miked."

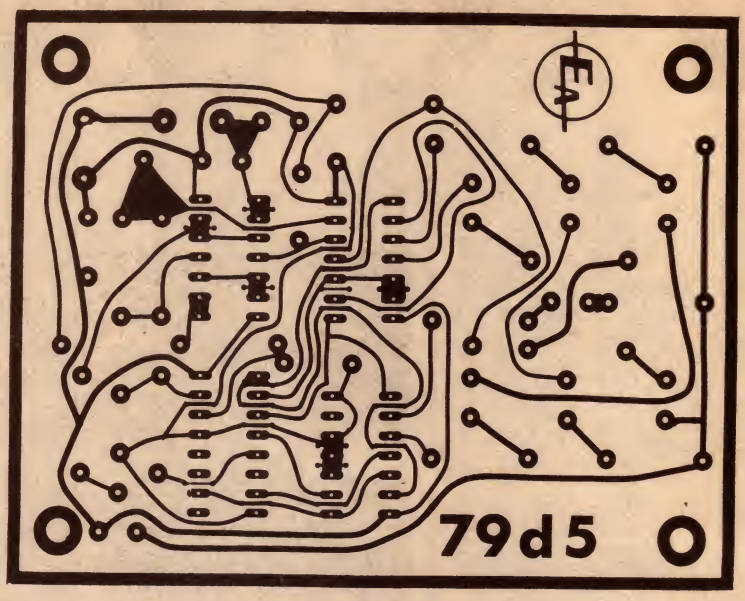
TELARC DIGITAL DISC
Holst Suite No. 1 in E Flat, No. 2 in F. Handel, Music for the Royal Fireworks. Bach, Fantasia in G. TEL 5038.

Stravinsky, The Firebird Suite (1918). Borodin Overture and Polovetsian Dances, Robert Shaw and the Atlanta Sym. Orch. Telarc DG 10039. Both digital discs reviewed Feb issue Electronics Australia. Price $19.50 each, Post Paid.

Available from

P.C. STEREO
P.O. BOX 272,
MOUNT GRAVATT 4122, QLD.
Trade enquiries welcome.

CMOS ELECTRONIC DIE . . .



Here is the PC pattern for the die, reproduced actual size to permit tracing if you desire. However PC boards should be available from commercial suppliers shortly after this issue is published.

This starts the oscillator again.

The unit is constructed on a single printed circuit board, coded 79d5, and measuring 91 x 71mm. Use the overlay diagram as a guide when mounting the components. The LEDs should be mounted as far as possible from the board, to bring them up close to the front panel of the box. Leave the CMOS devices until last, remembering to solder their power supply pins first, and to have your iron earthed.

Use a small piece of foam packing to secure the battery underneath the board. Mount the throw button at the opposite end of the perspex from the display, and connect it to the board with short lengths of hookup wire.

To test the completed die, simply press the throw button. One to six LEDs should remain illuminated, after a two second period during which all the LEDs should flash. If the unit fails to operate correctly, check for solder bridges and dry joints. Operation of the various sections of the circuit can be checked with a multimeter.

If you wish to construct a pair of dice, you will need to use a larger case. Two complete individual boards can be powered from the same battery, and connected to the same throw switch. Mount the boards across either end of the box, with the switch in the middle. The battery assembly can be clamped under one of the boards.

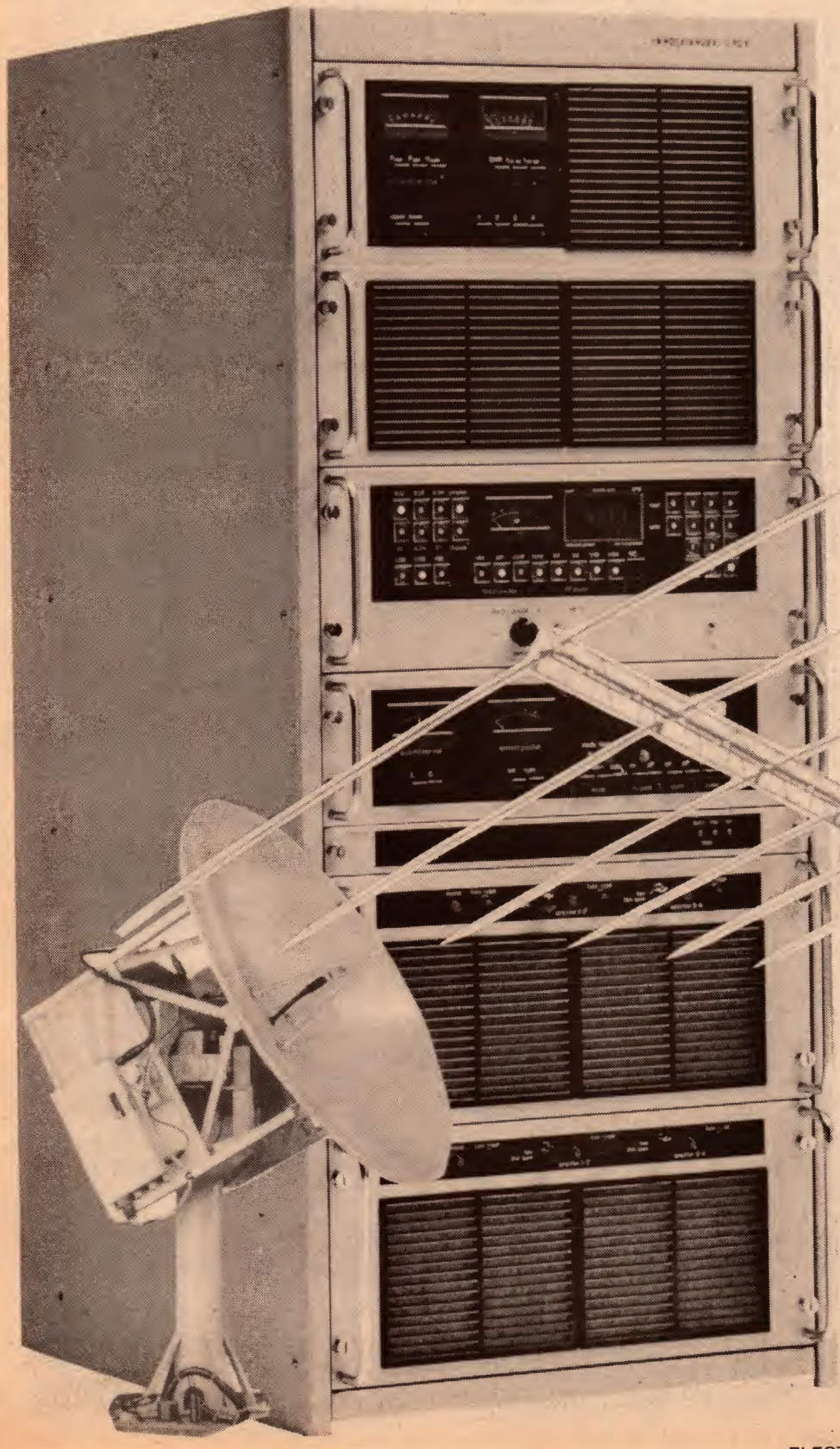
Now available

top quality rebuilt colour picture tubes
B & W also supplied
Prompt service
Very competitive prices

Write or phone:

COLOR TUBES INTERNATIONAL
1 CARTER ROAD, BROOKVALE, NSW 2100
(Office and Factory)
(02) 938 4063

VICOM International Pty. Limited



PROFESSIONAL PRODUCTS DIVISION

Supplying Australia and the Pacific:

- **Electronic Surveillance**
- **Low Light Video Surveillance**
- **Omega Receivers**
- **Rhombic & LPA Antennas**
- **Speech Security Systems**
- **Frequency Standards**
- **RF Signal Sources**
- **ISB HF Transceivers**
- **Marine Radar**
- **Counters 40GHz**
- **Digital & Analogue Test Equipment**
- **Spectrum Analysers**
- **Underwater Communications**
- **Tracking Oscilloscopes**

LET US QUOTE FOR YOUR SYSTEM

VICOM PROFESSIONAL PRODUCTS DIVISION,

68 EASTERN ROAD,
SOUTH MELBOURNE, VIC. 3205.
PH. (03) 699-6700
TELEX. AA30566

RF preselector for the broadcast band

Here's a little RF preselector that can really improve reception of signals on the AM broadcast band. It can boost the level of weak signals and at the same time attenuate adjacent interference and noise. Just the shot for broadcast-band DX enthusiasts!

by IAN POGSON

Let's say you're a broadcast-band DX enthusiast, who likes to log as many distant stations as you can. Or someone living quite a way from the nearest AM radio stations, who still likes to listen to them for the latest regional news, etc. Either way, you're likely to experience problems — weak signals, interference from strong adjacent signals or severe noise.

Luckily these problems can often be helped considerably by using an RF preselector unit like that described here, ahead of your existing receiver. The preselector provides additional gain, to boost weak signals, together with additional selectivity to help reduce the interference from adjacent signals and noise. It also has a ferrite rod aerial, whose directivity can be an advantage if your existing receiver doesn't have one.

Just how much improvement you're likely to get by using the preselector depends mainly on your existing receiver. If it already has a good ferrite rod aerial, plenty of gain and good selectivity (perhaps by virtue of an RF stage and multiple IF stages), the preselector may not be of much use — you're probably getting the best possible reception already. But this sort of ideal situation probably isn't too common; most modern receivers don't have an excess of either gain or selectivity.

In general, the best way to find out if the preselector will improve your reception is to try it. But where weak signals and interference are a problem, there probably aren't too many receiving setups which won't be improved by adding the preselector.

The prototype was tried out initially in our laboratory in the inner area of Sydney, where electrical noise is particularly bad. Using a communications type receiver with a random wire antenna, all of the local stations were received quite satisfactorily, although some were a little noisy. By adding the preselector instead of the random wire, those stations which were noisy were received with a noticeable reduction in noise.

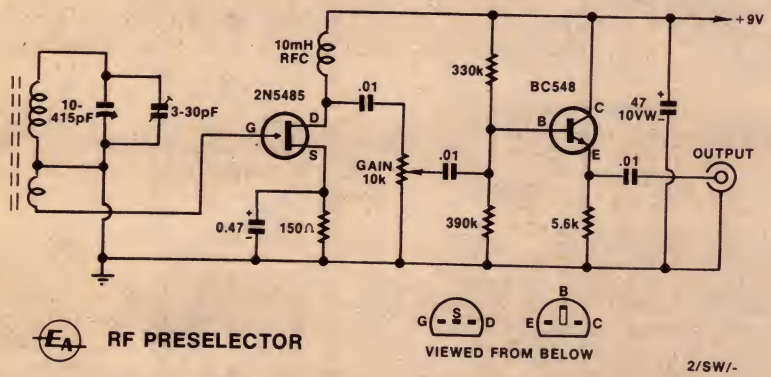
On the more ambitious side, we attemped to reach out beyond the immediate metropolitan area, for "DX" signals. A number of stations were received without the preselector, but were so noisy that they were of no entertainment value. One of these stations was 2CT, located south-west of Sydney in Campbelltown and only running a power of 100 watts. By adding the preselector the signal was brought up by a worthwhile amount but it was initially still noisy. This was improved by rotating the device, including the ferrite antenna, so that minimum noise was received. In spite of the severe noise problem, the station was then brought in quite well.

Another difficult one was station 2GO in Gosford, about 70km or so north of Sydney. To make the situation more difficult, station 2WL south of Sydney in Wollongong is much stronger and only separated from 2GO by 9kHz. This introduces a severe selectivity problem and the preselector can do only a little to alleviate this. However, by adding the preselector and tuning carefully, we were able to receive 2GO quite well.

As another example we checked the ABC Regional station 2CR in Orange, about 300km west of Sydney. It runs a power of 50kW and can be received in the Sydney area, but where noise is a problem reception is often not worthwhile. By adding the preselector again, we were able to bring 2CR up out of the noise and reception became quite good.

So that we could give some more examples of the use of the preselector under conditions which are less severe and more likely to approximate those for the average reader, I took the preselector home to a northern suburb of Sydney and connected it to a similar type of receiver. Under these conditions, the preselector was able to justify itself equally as well as under the noisy city conditions. Naturally, with noise much less of a problem, all of the stations referred to earlier were received loud and clear.

Needless to say, the preselector won't perform miracles. If a signal can be made useful by virtue of extra gain, a little extra selectivity and the ability of a ferrite rod antenna to discriminate against noise from a particular direction, then the preselector will be worthwhile. But naturally enough there is a limit: when signals are very weak, then very little can be done to make them usable.



A FET input stage is used to minimise cross modulation.

An aluminium case was used to house the prototype.

PARTS LIST

1 Box 130mm wide x 104mm high x 75mm deep (Australian Transistor Co.)
1 Front panel overlay
1 Jabel dial type HSO
1 Small knob
1 SPDT miniature toggle switch
1 10k linear potentiometer
1 Neosid ferrite rod 203 x 13mm, F14
1 Small rubber grommet
2 Rubber grommets for ferrite rod
2 Brackets for ferrite rod (see text)
1 Philips 3-30pF solid dielectric trimmer
1 RCA socket (single hole mounting)
1 RCA plug
1 2-pin miniature speaker socket
1 2-pin miniature speaker plug
4 Rubber feet
1 Roblan 10-415pF single gang variable capacitor
1 ¼in extension spindle
1 Miniature tagstrip with 7 prs tags
1 10mH RF choke
1 2N5485 transistor
1 BC548 transistor

RESISTORS, ½W: 1x150 ohms, 1x5.6k, 1x330k, 1x390k.
CAPACITORS
3 .01uF LV plastic
1 0.47uF 35VW tantalum
1 47uF 10VW electro
MISCELLANEOUS:
Hookup wires, solder, solder lug, screws, nuts, 22B&S enamel copper wire, audio type coaxial cable.

NOTE: Resistor wattage ratings and capacitor voltage ratings are those used on the prototype. Components with higher ratings may generally be used providing they are physically compatible. Components with lower ratings may also be used in some cases, provided the ratings are not exceeded.

The foregoing comments generally apply to daylight reception conditions. Quite a different set of conditions normally apply for night time reception. In general, literally dozens of stations may be tuned in at night, coming from country towns and other states. Even under these conditions, the preselector can be very useful in improving reception of many of these signals.

There is one important point to note concerning night time reception. Stations from about 75 to 150km distant come into the category where both ground wave and sky wave signals may be present at the same time. This can lead to severe distortion of the audio component. This may occur only sporadically, or it may be such that the signal is rendered useless. There is little which can be done in this type of situation.

The circuit of the preselector is just about as simple as it could be. There is a ferrite rod with two coil windings, the larger one being tuned to the wanted signal by a 10-415pF variable capacitor and a 3-30pF trimmer in parallel. The small winding conveys the signal to the gate of a junction FET, which is self-biased with a 150 ohm resistor in its source. The resistor is bypassed to RF with the 0.47uF shunt capacitor, to prevent degeneration. The drain load is a 10mH RF choke.

The amplified signal is taken from the FET drain via a .01uF DC blocking capacitor to a 10k gain control. From the gain control rotor, the signal is fed via another .01uF blocking capacitor to the base of a bipolar transistor wired as an emitter follower. The emitter follower is biased with the 330k and 390k resistors and has a 5.6k emitter load resistor. The signal emerges from the emitter follower via another .01uF capacitor to the output socket. The purpose of the emitter follower is to transform from a high to a low impedance, so that the high output impedance of the FET may be matched into the low impedance aerial input of a following receiver.

It may be seen from the circuit that a power supply of 9 volts is required. The current is just a few milliamps and this may be supplied by a dry battery or any other suitable DC source. Although 9V is specified, anything between about 7 and 12V will suffice. The use of a plug-pack mains adapter can be recommended. The Ferguson type PPA6 or equivalent will give about 9V DC with the small load current involved.

Construction may be best approached by making up the sub-assemblies first. The ferrite rod aerial involves a winding operation and making up a pair of brackets. Before winding can be done, a cardboard former is needed. Take a piece of flat cardboard and cut a piece about 60mm long and wide enough to that it will just bend around the ferrite rod, with the edges butted together. This operation calls for some patience as it is a little tricky to get it just right. Complete the tube by wrapping it with some good quality insulation tape.

Start the main winding about 10mm from one end of the former and anchor the start of the winding with some insulation tape. Use 22B&S enamel wire and wind on 42 turns, terminating with another piece of tape. Leads of 20 to 30mm should be left at each end until they are cut later on. Leave a gap of 4mm after the finish of the first winding and wind on another 6 turns, leaving leads as before.

Cut the four leads to about 10mm long and clean the enamel from each, right back to the windings. Tin the leads and twist the two adjacent ones together and solder them. Now bend the resultant three terminations into a small loop. Slide the coil along the rod so that the end of the 6 turn winding is about 50mm from the end of the rod. Now solder the lug of the fixed plates of the Philips trimmer to the extreme end of the 42 turn winding and join the other lug to the twisted termination of

"Resolution of the 4·43MHz sub-carrier was better on the TRIO CS1560A scope..." says Ian West, National Service Manager, Toshiba Australia.

Ian West is responsible for all Toshiba service within Australia. This includes three service divisions and liaison with over 500 service agents. We asked him why he chose the Trio CS1560 scope for service use.

"We found that for TV., audio and VCR servicing, the Trio has a brighter display on H.F. signals. The Resolution of the 4.43 MHz subcarrier is better due to the scopes' 15MHz bandwidth.

"Also my job involves training other technicians, so we were looking for a scope that's easy to drive. The 1560 has proved ideal for setting up VCRs. Using its chop facility we can easily compare counted down signals with the original.

"We are using quite a few Trio instruments. They offer excellent value with just the right extra features that we need."

Check the full Trio range from . . .

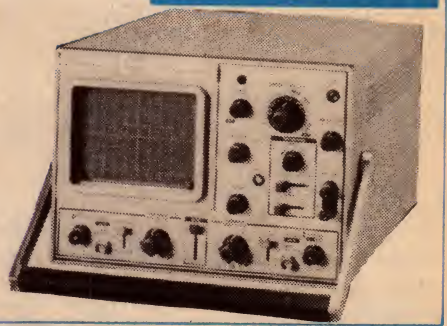
CS 1560 15MHz, 10mV, Dual Trace.

- 130mm CRT
- DC-15MHz/10mV
- Automatic sweep (AUTO FREE RUN)
- Display modes (CH1 CH2 DUAL ADD SUB)
- Full sensitivity X-Y operation

• SPECIFICATIONS

Bandwidth	DC to 15MHz (−3dB)
Deflection factor	10mV/div to 20V/div
Input R.C	1MΩ, 22pF
Risetime	23nsec
Overshoot	Better than 3%
Sweep time	0.5μs/div to 0.5s/div
Magnifier	x 5
Linearity	Better than 3%
Calibrator	1Vpp (1kHz square wave)
Intensity modulation	More than 20Vpp
Phosphor	P31
Power	AC 100/120/220/240V, 50/60Hz, 23W
Dimensions	W260 x H190 x D385 (mm)
Weight	8.4kg

TRIO



PARAMETERS PTY LTD Sydney 439 3288 Melbourne 90 7444

NSW	SYDNEY	George Brown & Co	519 5855
		Martin de Launay	29 5834
		Radio Despatch	211 0191
		Dick Smith Stores	439 5311
		Standard Comps	660 6066
	GOSFORD	Brian Bambach	24 7246
	N'CASTLE	D.G.E. Systems	69 1222
A.C.T.	CANBERRA	Electronic Comps.	95 6811
QLD.	BRISBANE	Audiotronics	44 7566
VIC.	MELBOURNE	Browntronics	419 3986
		Douglas Radio	211 1698
		J.H. Magrath	663 3731
		Radio Parts	329 7888
		G.B. Telespares	328 4301
	GEELONG	Teleparts	21 7288
S.A.	ADELAIDE	K.D. Fisher & Co.	269 2544
		Gerard & Goodman	223 2222
		Trio Electrix	51 6718
W.A.	PERTH	Henderson Inst.	381 4477
		W.J. Moncrieff	325 5722
		Willis Trading Co	321 7609
TAS.	HOBART	Imbros Scientific	28 5997

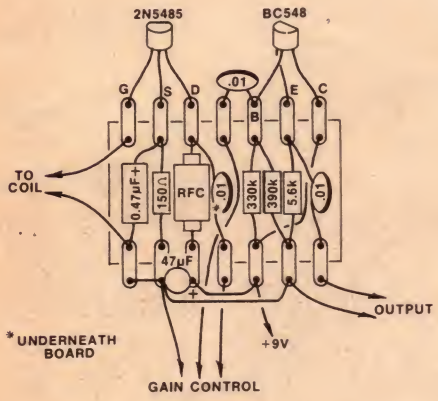
PM98

the coils with a piece of tinned copper wire. The two rubber grommets may be slipped on to the rod and the assembly put aside for the time being.

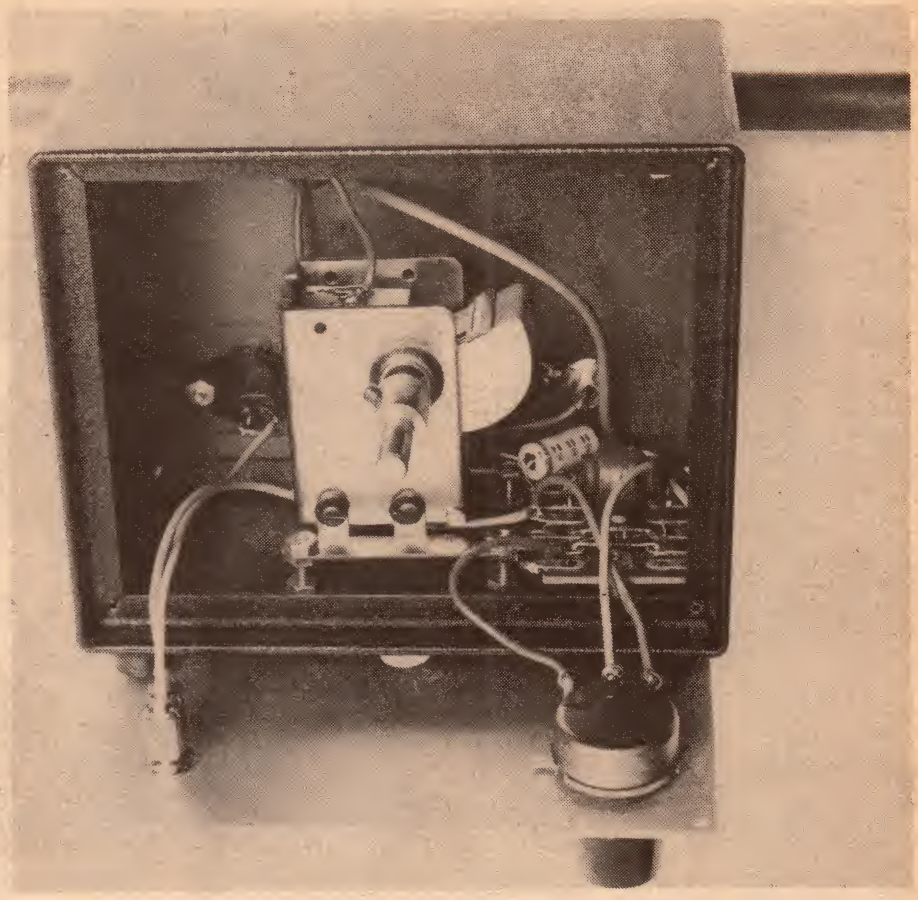
Make up a pair of brackets, one each right and left hand. Scraps of 16 gauge aluminium are ideal but brass, copper, or mild steel may be used. The drawing shows how this is done.

Now assemble and wire the small tagboard. This task is an easy one and it is made clear by the diagram. Make sure that all leads are kept short and neat and that all soldered joints are done properly. Care should also be taken to make sure that component polarity is observed where required, and overheating should be avoided when soldering. When complete, a careful check should be made to ensure that there are no errors or omissions.

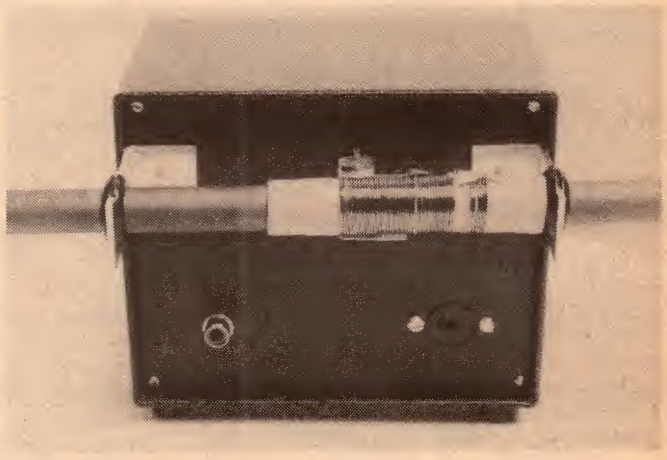
The necessary holes should now be drilled in the box, including the front and back panels. The position of each item may be obtained from the pictures. Care should be taken to make sure that the mounting holes for the variable capacitor are such that the spindle is on the centre line of the front panel. Also, the spindle clearance hole in the front panel should be at the correct height; the feet of the capacitor will need to be about 8mm above the bottom of the box. Holes for mounting the tagboard assembly should coincide



Follow this simple wiring diagram.



ABOVE: this internal view shows how the assembled tagstrip and the tuning capacitor are arranged inside the case. Note how the tuning capacitor is stood off the bottom of the case.



RIGHT: rear view showing how the ferrite rod aerial is mounted. The output socket is at bottom left, while at bottom right is the power supply input socket.

with the two end centre holes of the board, and the board when mounted should clear the wall of the box and the feet of the capacitor.

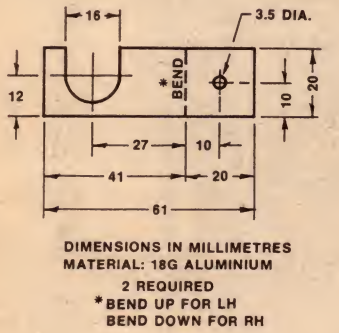
When assembling the variable capacitor and the board assembly into the box, they are stood off the bottom of the box by means of screws, with three nuts on each screw. A solder lug is fixed under the top nut of the capacitor mounting screw at the front and nearest the board assembly. The lug is directed to the adjacent earth lug and then soldered. The extension spindle on the variable capacitor is fixed after it has been cut to the right length.

During the process of fixing the components to the box, interwiring should be done at the same time. Leads to and from the panels should be left slack enough to allow access to the inside with the panels suitably hinged out of the way. While we did not use a shielded or coaxial lead from the output point on the board to the output socket on the back panel, it would be a good idea to do this to ensure that there will be no trouble with instability.

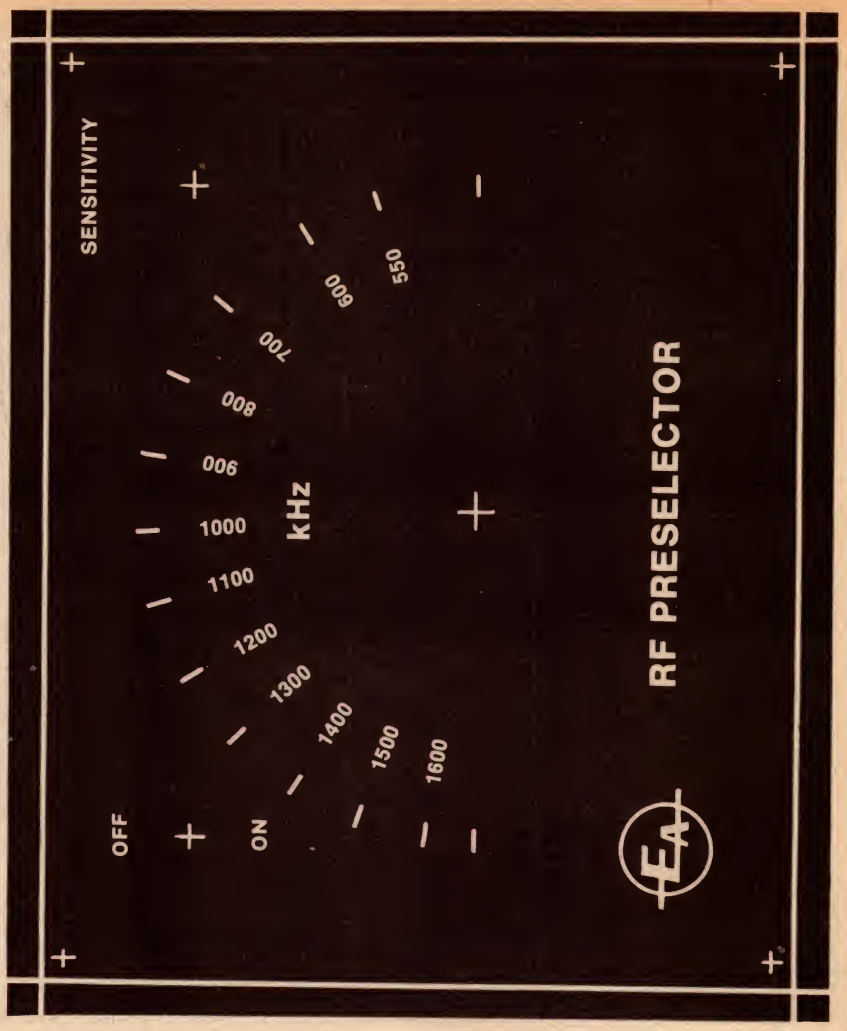
The leads to the ferrite rod aerial windings are run through a rubber grommet in the back panel. The earth lead is run to the earth lug on the output socket and this is also run to the negative supply line at the supply socket, as well as running to the nearest earth point on the board. The lead from the 6 turn winding on the coil is run in audio type coaxial lead to the gate of the FET.

With assembly and wiring complete, it is a good idea to go over the preselector and make sure that all is well before applying power. Having done all this, a source of 9V DC is required, as mentioned earlier. The next consideration is just how to feed the output of the preselector into the receiver. There are two general possible situations — where the receiver is provided with aerial and earth terminals and the case where there are no terminals and the receiver already uses a ferrite rod aerial.

Where aerial and earth terminals are provided, it is quite easy to run a short length of coaxial lead from the output socket of the preselector to the appropriate terminals on the receiver.



Here is the metalwork diagram for the two aerial rod support brackets.



Actual size reproduction of the front panel artwork.

In the case where a receiver has a built in ferrite rod aerial, the easiest way to couple in is to take a length of insulated hookup wire and wind it around the receiver case, at right angles to and incorporating the ferrite rod. Three turns should be sufficient; then twist the leads together, making a twisted pair about 600mm long. Run these back to the output socket of the preselector.

Note that when using the preselector with a receiver of this type having its own ferrite rod aerial, there is a risk of instability if the two are brought too close together. If you suspect that this is happening, the cure is to move the receiver away from the preselector and also try rotating the receiver so that its aerial rod is at right angles to the preselector rod.

With the preselector coupled to the receiver, we are now ready to make initial checks. Tune the receiver to a weak station and with the gain control on the preselector well advanced, peak up the received signal with the tuning knob on the preselector. Rotate the preselector for a drop in signal strength. This should be fairly sharp and the rod will be pointing in the direction of the transmitter. The preselector should then be turned at right angles to this position. The gain control is adjusted for the best results.

If, having adjusted the preselector thus far, there is still a problem with noise or interference from a nearby transmission, the preselector should be carefully rotated to find a possible alternative position which reduces the problem. The best teacher is experience: after a short while it will become clear as how to get the best out of the preselector.

After the preliminary tests the preselector will need to be calibrated so that the pointer on the dial scale has real meaning. We have reproduced the front panel details so that manufacturers who see fit may provide ready made panels complete with calibrations, etc. On the other hand, readers may see fit to make use of the reproduction in the magazine to make up a panel.

Before attempting calibration, the dial should be rotated so that the variable capacitor is fully closed. The two lines, one at each extreme end of the scale, should be used to position the dial correctly on the spindle.

Tune in to a station of known frequency at the low frequency end of the band and adjust the preselector tuning for maximum. Any error in reading may be corrected by sliding the coil on the rod. Now tune in a station of known frequency at the high frequency end of the band and make the necessary corrections with the trimmer on the coil. Repeat the process a number of times until the calibrations are correct at both ends of the band.

If you are able to use a signal generator and elect to do so, then all you have to do is to set the generator to the wanted frequency, bring the generator's output lead close to the coil on the ferrite rod, adjust the output level of the generator and proceed as above.

After the preselector has been accurately calibrated, it is wise to make use of the calibrations when attempting to tune in a difficult signal. Unless the preselector is set fairly close to the wanted frequency, there is the possibility that it will respond to a stronger signal near to where it is set, causing some confusion due to spurious responses.

Sydney's First

HOME COMPUTER SHOW

be there!

ADMISSION:
Adults $2.00
Children $1.00
STUDENTS $1.00

LOWER SYDNEY TOWN HALL MAY 24th-27th: OPEN DAILY 10am—6pm (Sat. 8pm)

FOR COMPUTER HOBBYISTS BUSINESSMEN AND EDUCATORS:

*Complete personal and business computers
*Computer kits
*Components, sub-assemblies peripherals
*Software for home or business etc., etc.

FOR THE GENERAL PUBLIC:

*Programmable and conventional T.V. games
*Microprocessor based consumer products and games
*Home video units
*Viewdata and teletext decoders
*The widest range of microprocessor based gadgets ever assembled under one roof in Sydney!

FULL LIST OF EXHIBITORS AND LECTURES NEXT ISSUE

FREE SEMINARS!
- **FOR BEGINNERS**
- **FOR ENTHUSIASTS**
- **FOR STUDENTS**
- **FOR BUSINESSMEN**

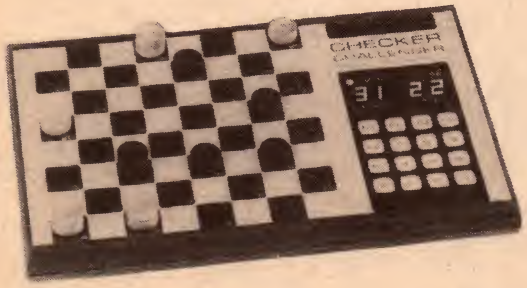
PRESENTED BY:
AUSTRALIAN SEMINAR SERVICES PTY. LTD.
INQUIRIES: (03) 267 4311, (02) 290 2348

COMPUTERS ARE FUN

COMPUTER CHECKER CHALLENGER BREAKTHROUGH!!

$99.95

IT'S YOU AGAINST THE COMPUTER!



NEW RELEASE

For the first time! The famous quality and reliability of the Fidelity Electronics Challenger Series at an affordable price. The latest 2 level Checker Challenger at an unbelievable $99.95! Carrying the famous Futuretronics 3 months warranty, guarantee that your computer will be serviced by factory trained technicians in the unlikely event of electronic malfunction.

Checker Challenger 2 features:

1. Selection of offense or defence
2. Position verification by computer memory recall
3. Random computer responses vary every game
4. Change level of difficulty before any move
5. Does not permit illegal moves
6. Bonus booklet secrets of the experts included FREE.

Checker Challenger 2 with two levels of difficulty for beginner to advanced players. The challengers sophisticated program incorporates random responses, helps you learn, improves your skills, and is ready to play when you are at an incredible low price. Comes complete with solid wood, stackable checker pieces, SEC approved 9 volt transformer in polystyrene dress box, the perfect gift.

Limited stocks available. Only 500 Checker Challenger 2's available at this price, so don't miss out. Orders will be fulfilled in strict order of receipt of coupons. First come first served.

Name .....
Address .....
Postcode ..... Enclosed is cheque/postal order $
Please send Checker Challenger 2

DELIVERED FREE ANYWHERE IN AUSTRALIA BY REGISTERED POST. SEND ORDERS TO: COMPUTERS ARE FUN, PO BOX 382, CHELTENHAM, VIC., 3192.

Third prizewinner of the EA-Parameters project competition

Simple, effective car burglar alarm

This project was the third prize winner in our recent Parameters/Electronics Australia Instrument Contest No. 1. For those readers who would like to build a car alarm, but who may have been deterred by more elaborate designs, this project should have a special appeal. Though of simple design and modest cost it has, according to the owner, already proved its worth on a number of occasions.

by JOHN RUSSELL

3 Hussar Place, Christchurch 2, New Zealand.

This alarm was designed approximately two years ago and a number have been fitted to cars owned by friends and acquaintances. The unit has been so successful, in fact, that I have had nine reports of them going off in anger, thus foiling the attempted theft of car and/or valuables.

Basically the circuit monitors the battery voltage of the vehicle and detects when any load is applied to it (courtesy light, ignition, etc). The vehicle must obviously have a door operated courtesy light system but no direct connection to this is required.

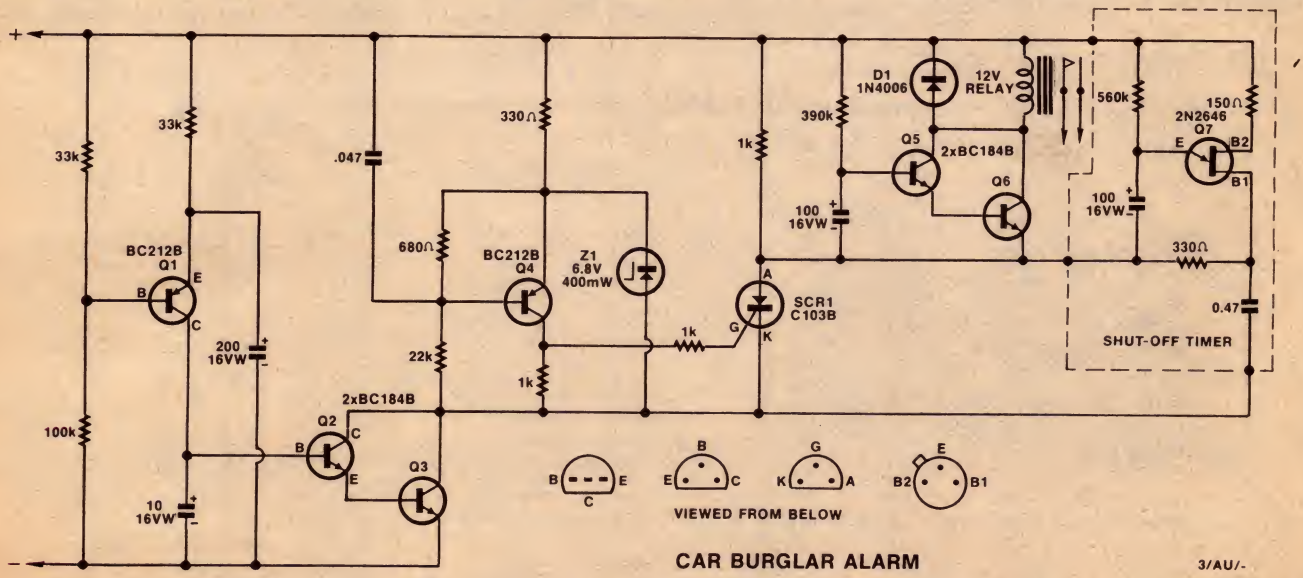
There is a hidden switch inside the vehicle which the driver turns on when getting out. The unit waits for 20 seconds (exit time) and arms itself. This allows time for doors to be shut without setting off the alarm.

With the unit armed, the next time the door is opened, the alarm latches, but waits for seven seconds (entry time) before activating the horn. If the driver opens the door he would, of course, turn the hidden switch off before the seven seconds elapsed. The horn would not sound at all in this case.

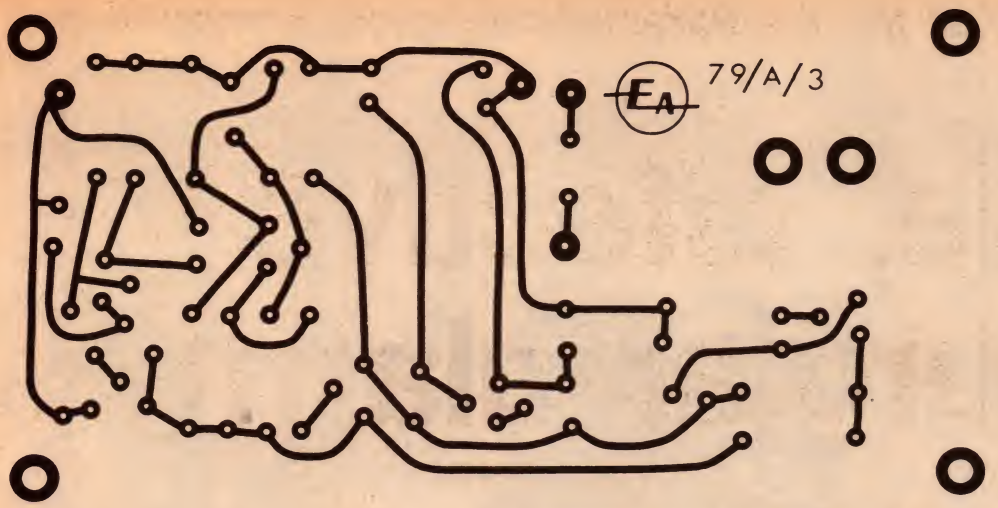
Once the horn starts, it would keep sounding until the hidden switch was turned off. By adding a simple shut-off timer, as shown, the horn will turn off after a predetermined time. After the automatic shut-off, the unit is still armed and will await the next entry to the vehicle and go through the entry time/shut-off time again ad infinitum.

The exit timer of approximately 20 seconds is made up of Q1, Q2, Q3 and associated components. On application of power by the hidden switch in one of the supply rails, Q1 base is held at a fixed potential and Q1 emitter voltage rises expotentially by the 200uF capacitor charging through the 33k resistor. When Q1 saturates, it supplies base current to the darlington pair Q2, Q3.

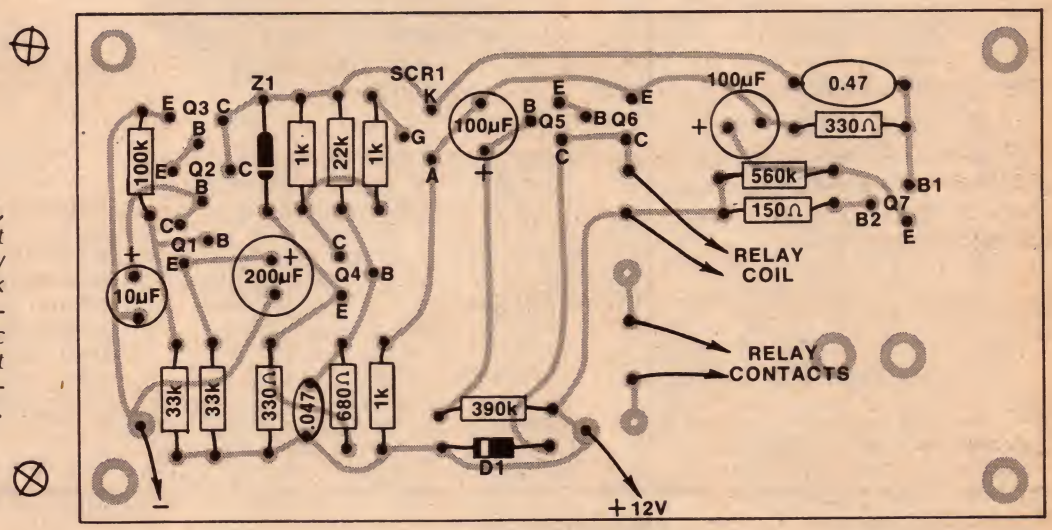
As the collectors of Q2, Q3 fall at the end of the exit time, power is applied to the detector circuit, which consists of



The circuit is relatively simple and uses readily available components, none of which is particularly critical. The shut-off timer (in dotted box) is optional. The "secret switch" may be anywhere in the positive supply line.



The printed board, shown full size, from the copper side. It incorporates both the alarm circuit proper, and the optional automatic shut-off timer. Note the mounting holes (beneath the code number) to suit one of the suggested relays.



The component layout, shown from the component side of the board. The relay may be mounted in the blank area in the lower right corner. The optional automatic shut-off components are at the top right near (and including) the unijunction Q7.

Q4,SCR1, and associated components. The emitter of Q4 is clamped at 6.8 volts by the zener diode, while its base if biased fairly hard off. The 0.05uF capacitor will couple any sudden voltage change on the battery (from courtesy light, etc coming on) to the base of Q4 from which will be amplified and inverted. This positive going pulse is fed to SCR1 which conducts and latches.

This action takes the emitter of Q6 and the negative end of the 100uF capacitor to almost negative rail. This applies voltage across the entry timer consisting of Q5, Q6 and associated components.

The 100uF capacitor charges via the 390k resistor and after approximately seven seconds turns on the darlington pair Q5, Q6. With Q5, Q6 collectors going low, the relay pulls in and thus sounds the horn.

By connecting the shut-off timer as shown, the moment SCR1 latches it initiates the shut-off timer. This consists of Q7 which fires after the timing period set by the 560k resistor and the 100uF capacitor. The unijunction firing pulse is coupled via the 0.47uF capacitor to the cathode of SCR1, which turns off the latched SCR.

To install the alarm in a vehicle, merely connect the positive lead from the unit to the positive terminal of the battery via the hidden switch, and the negative lead to the negative terminal of the battery. The hidden switch does not carry horn current so it can be of a low current type.

It is imperative that the positive and negative leads make good connections and it is preferable to take them straight to the battery posts, although the chassis may be used as the common if desired.

The relay contacts which will control the horn may be wired in several ways, depending on the vehicle and horn switching used by the manufacturer. If the horn can be operated with the ignition turned off, it is then a simple matter of connecting the relay contact wires straight across the horn button. If

PARTS LIST

1 Box Aluminium, 2-piece, 133 x 76 x 54mm, or Plastic (Zippy) 150 x 90 x 50mm
1 Relay. 12V DC. Contacts to suit horn current. "Keyswitch" KMK3, "Pye" 265 or similar
1 Switch, single pole, for "secret switch" as selected
1 Printed board, 79/A/3, 125 x 65mm

TRANSISTORS etc

1 6.8V 400mW zener diode
1 1N4001 diode (or similar)
4 BC184B NPN transistor (BC183, BC237)
2 BC212B PNP transistor (BC307, 2N3702)
1 C103B SCR (C106A)

EXTRA FOR TIMER

1 2N2646 Unijunction

RESISTORS (½W)

1 330 ohm
1 680 ohm
3 1k
1 22k
2 33k
1 100k
1 390k

EXTRA FOR TIMER

1 150 ohm
1 330 ohm
1 560k

CAPACITORS

1 10uF 16V
1 200uF 16V
1 .047uF
1 100uF 16V

EXTRA FOR TIMER

1 0.47uF
1 100uF 16V

MISCELLANEOUS

Connecting cables, hardware, nuts and bolts, support spacers for printed board, etc.

not, it will be necessary to check with the vehicle wiring diagram, and possibly supply a new live feed to the horn via the relay contacts.

It would be advisable to let the alarm actually sound the horn at least about once a fortnight, to test the complete system.

If the exit/entry/shut-off times are not quite as required, they can be altered by changing the appropriate charging resistors. Increasing the resistor value increases the time period.

Editorial comment: Mr Russell submitted two separate board patterns; one for the alarm proper and one for the optional shut-off timer. In the interest of economy, we have combined these two patterns into one board and provided an area on which the relay can be mounted. This still leaves the option of fitting the timer or not, simply by fitting or omitting the components.

The board, with relay fitted, should fit easily in at least two popular boxes, as suggested in the parts list. Although not essential, most builders would probably prefer to provide a box as a means of protecting the components.

The author suggested the "Pye" type 265 relay, and that this could be mounted on its side by glueing it to the component side of the board. The "Pye" relay is available in Australia from Davred Electronics Pty Ltd.

Another very suitable relay is the "Keyswitch" type KMK3 which, although designed as a 24V AC relay, functions quite reliably from about 9V DC upwards. It is fitted with heavy duty contacts which may be paralleled for increased reliability. It is a 2-hole mounting type (screw and locating spigot) and the positions for these two holes have been marked on the board pattern. The "Keyswitch" relay is available from Radio Despatch Service.

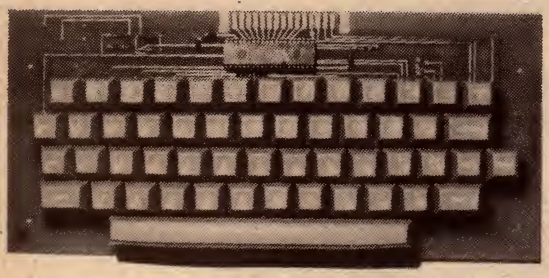
Some cradle type relays may also be suitable, but it is important that the contacts be suitable for horn current involved, unless the car is already fitted with its own horn relay.

It only remains to find a suitable location for the hidden switch. It would be unwise to suggest any particular places, since this tend to make them unduly popular and, therefore, well known.

While it need hardly be stressed that the location should not be obvious, it is also important that it can be operated without the need for an obvious movement. Would-be car thieves are not above studying a driver's regular parking habits if his particular car is the one they have set their sights on.

So here is a chance to exercise your ingenuity.

Two relays suitable for the alarm. At left is the "Keyswitch" KMK3 and at right the "Pye" 265. The "Keyswitch" mounts with a single screw, while the author suggests that the "Pye" may be laid flat and glued directly to the board.



FULL ASCII KEYBOARD

LOW COST!
Model 756
Full ASCII
Keyboard

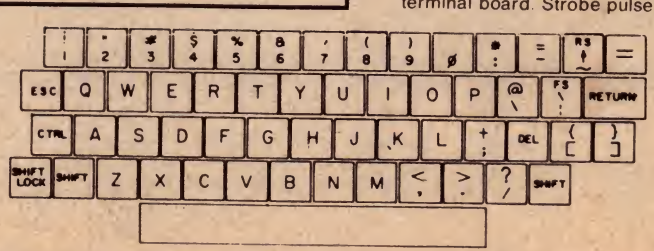
Numeric Keyboard Pad ..... $10.95 (optional)
Plastic Enclosure Type 701 ..... $16.00
Mounting Frame (supplied attached to keyboard for extra rigidity) ..... $9.75 (optional)
DC/DC Converter $7.25

- Intended for professional microprocessor applications.
- This one Keyboard will meet most present and future requirements.
- Full 128-character ASCII 8-bit code
- Tri-mode MOS encoding.
- Applications notes for auto repeat, numeric pad, serial output.
- Upper and lower case characters generated by keyboard with latching shift-lock.
- Selectable polarity.
  Size 305 x 140 x 32mm (12¼ x 5½ x 1¼in)
- MOS/DTL/TTL compatible outputs.
- New guaranteed OEM grade components.
- Needs +5 and —12V supply.
- Board has space for low-cost DC/DC converter so that entire unit operates off single 5V rail.

Price assembled $74.00

Price includes air parcel delivery anywhere in the world. Most currencies acceptable at exchange rates ruling on date your order is posted. Drafts and cheques acceptable (if personal cheques not bank-guaranteed, allow 14 days to clear).
Barclaycard and most major credit cards honoured.

- User selection of positive or negative logic data and strobe output.
- Alpha lock.
- Extra loose keys available.
- Gold Plated Edge Connector (if needed) $2.00.
- Rugged mil. spec. G—10 PCB with plated through holes.
- 2-key roll-over.
- DC level and pulse strobe signal for easy interface to any 8-bit input port microprocessor system, video display or terminal board. Strobe pulse width 1 ms.



Carter Associates
P.O. Box 11262
VLAEBERG
South Africa
postal code 8018

HEY LOOK AT THIS! Mail Order Specials

LINEAR

SN76018 10W AMP	$1.50
LM301A 2 PACK	$0.70
555 TIMER	$0.32
741-CAN METAL CAN	$0.55
741 8 PIN	$0.34
LM3900	$0.87
LM3909	$1.20
SN76477 COMPLEX SOUND CEN	$4.80

REGULATORS

LM309K 5 VOLT	$1.25
LM340-12 12 VOLT	$0.90
7805P	$0.90
7812P	$0.90
7815P	$0.90

OPTO

TIL 209 TI RED	$0.55 FOR 3
TIL 220 TI ¾ RED	$0.55 FOR 2
TIL 222 TI ¾ GREEN	$0.75 FOR 2
TIL 224 TI ¾ AMBER	$0.82 FOR 2
TIL 305 5 x 7 ALPHA DISP	$3.32
TIL 312 .3" 7 SEG C A	$1.75
TIL 313 .37 SEG C C	$1.75

MEMORY IC'S

2102A-4 1K STATIC	$1.35
2114/4045 4K STATIC	$9.50
5101-8 256 x 4 CMOS STATIC	$3.00
4116 16K DYNAMIC	$20.50
2708 1K x 8 EROM	$16.50

CRYSTALS (t 0.005% @25°C)

XTAL – 1 Mhz	$7.70
– 1.8 Mhz	$7.70
– 2 Mhz	$7.70
– 4 Mhz	$6.60
– 5 Mhz	$6.60
– 6 Mhz	$6.60
– 10 Mhz	$6.38
– 12 Mhz	$6.38

TTL

7400 3 pack	$0.66	7486 3 pack	$0.66
7401 3 pack	$0.66	7490 ea	$0.55
7403 3 pack	$0.66	74145 ea	$0.50
7404 3 pack	$0.66	74172 ea	$0.78
7410 3 pack	$0.66	74174 ea	$1.25
7430 3 pack	$0.66		
7438 3 pack	$0.66		
7439 3 pack	$0.85		
7448 ea	$1.10		
7472 3 pack	$0.66		

ALL PRICES INCLUDE TAX

bankcard welcome here

from silicon valley

P.O. BOX 898 CROWS NEST. N.S.W. 2065 AUSTRALIA

SYDNEY
23 Chandos Street, St Leonards
Tel (02) 439 2965

MELBOURNE
380 Bridge Road, Richmond
Tel (03) 429 4780

ADELAIDE:
170 Sturt Street, Adelaide
Tel: (08) 51 4080

BRISBANE:
22 Ross Street, Newstead
Tel: (07) 52 1339

NEW ZEALAND:
AUCKLAND
7-9 Kirk Street, Grey Lynn
Tel: 76 1169

Making use of audio indicators

The circuits described in this article have two things in common — all are based on the use of solid state audio indicator modules, and all are quite practical. There are seven circuits altogether, including a rain detector circuit, a car headlight warning unit, a turning indicator alarm, and a capacitance activated buzzer.

☆ **Rain detector** ☆ **Car Headlight Warning** ☆ **Turning Indicator** ☆ **Low-cost sensor** ☆

Many electronic circuits make use of some sort of audible output device, particularly when the circuit is used in an alarm situation. In the past, buzzers or a loudspeaker driven by an audio amplifier were the most common forms of audio output device; but in recent years a range of self-contained solid state audio transducers has become available. These have the advantage of low cost and compact size.

Four different audio indicators are used in the circuits described here: AI124, AI125, X50W12A and X70W06. All are imported by Instrument Technics (Victoria), from Projects Unlimited of Dayton, Ohio.

Basically, the audio indicators used fall into two broad types. The AI124 is an electronic/mechanical transducer, while the other three units are all piezo-electric transducers. A third type of audio transducer, based on a small speaker, is also listed in the Projects Unlimited catalog, but this type is not used in the projects described here.

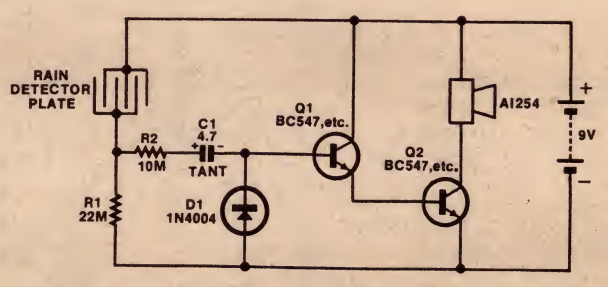
An electronic/mechanical transducer consists of a tuned reed driven by an electronic oscillator. These audio indicators emit a buzzing sound high in harmonic content, around 375Hz in the case of the AI124.

Piezo-electric transducers differ in that they are made of a thin ceramic element bonded to a brass disc. The element is electrically attached to an audio oscillator circuit which causes the element and brass disc to flex, thus generating sound waves. Claimed advantages of piezo-electric transducers include lower power consumption and higher sound level output than electronic/mechanical types.

Readers will note that, as used in the following circuits, the piezo-electric transducers all feature two-wire termination, these being the power leads. The AI124, on the other hand, has a third lead connected it. This lead is a "control" line,and a minimum of 0.5V must be present on this line for the buzzer to be activated. The sound output increases to a maximum as the control voltage is increased to 1V.

The transducers used in the following circuits by no means represent the complete range imported by Instrument Technics. Those readers requiring further information regarding availability and price should contact the company at PO Box 224, Doncaster, Victoria 3108. Telephone (03) 842 5661.

Rain Detector



RAIN DETECTOR

This simple circuit will not stop the rain, but at least it will help the lady of the house to get the washing dry — by sounding a warning buzz when the rain starts. Of course, there are many other uses for a simple moisture alarm. The device could, for example, be used as a pool splash alarm, a bed-wetting alarm, or as an indicator that the bath water has reached the desired level.

Main features of the circuit are as follows:

- Zero standby current, as no power switch is required;
- Unit switches off automatically after about 3 minutes. It will automatically retrigger if the sensor plate dries and becomes wet again;
- Maximum current drain is 5mA, giving a long battery life; and
- Low cost and low component count.

In addition to the AI254 audio indicator, the circuit uses two low cost NPN transistors (BC547) or similar and a handful of other components. The detector plate, or sensor, can be made out of a small piece of Veroboard with alternate copper strips connected in

The four audio indicators used in the seven projects. Clockwise from top left: X70W06; X50W12A; AI254; and AI124.

Seven useful circuits from Derek Williams, Instrument Technics

Capacitance activated buzzer ☆ Light beam alarm ☆ Reversing buzzer

parallel. Power for the unit can be supplied from a small 9V battery.

Circuit operation is as follows: When the sensor plate is dry, the base of Q1 is held at ground potential and Q1 and Q2 are turned off. However, when the detector plate gets wet, its resistance drops to a finite value, and current flows in the base of Q1. Q1 thus turns on, turning Q2 and the audio indicator on in turn.

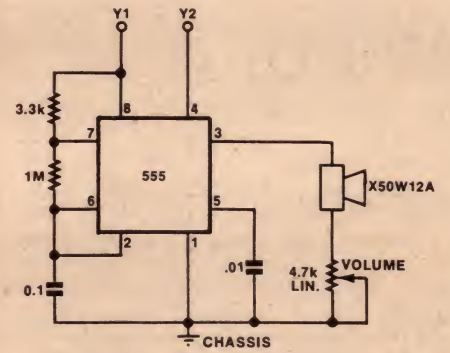
As C1 charges, the current through the base of Q1 gradually decreases. After about 3 minutes, Q1 turns off, turning off Q2 and the audio indicator. When the sensor plate dries, C1 discharges through D1, R1 and R2, and the unit is ready for retriggering.

Reversing Buzzer for Cars

As part of the design rules for Australian cars, all new cars must be fitted with reversing lights. These can be either separate white lights, or the amber indicator lights. In either case, they must come on when reverse gear is selected and the ignition is on.

However, situations do exist where some form of additional indication is warranted, particularly when reversing out of concealed driveways. An effective audible reversing indicator can be made using just one 555 timer IC, an X50W12A audio indicator and a few low-cost components, as shown in the accompanying circuit. A volume control is fitted in series with the audio indicator, and can be adjusted as required.

The sound output from the audio indicator is a 2.7kHz tone, pulsed on and off at a rate of 7Hz by the 555 timer IC. The reset pin, pin 4, is used to make the timer also function as an AND gate, so that the unit can be used with vehicles that use the amber indicator lights as reversing indicators. In this



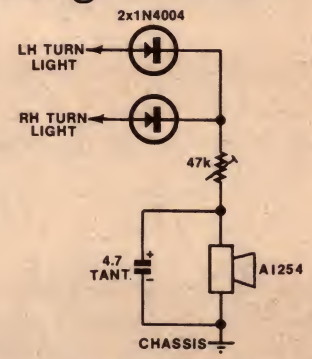
REVERSING BUZZER FOR CARS

case, Y1 and Y2 are run to the +12V sides of the left and right hand turn indicator bulbs respectively.

For cars fitted with separate reversing indicators; Y1 and Y2 are connected together, and a single wire run to the +12V side of the lights.

One further point: substituting the AI254 for the X50W12A will give a substantial cost saving at the expense of available audio output.

Audible turning indicator



TURNING INDICATOR

In many cars, the mechanical click of the turning indicators is barely audible and the indicator may be inadvertently left on. This is most undesirable. Failure to cancel turning indicators is not only a traffic offence — it could also be the cause of a serious accident.

The circuit featured here is designed to overcome this problem. It costs just a few dollars, can easily be installed behind the dash panel, and will deliver a 4kHz tone whenever the turning light flashes. The volume of the tone is easily adjusted for personal preference.

The two diodes act as an OR gate, delivering current to an AI254 audio indicator from either one of the turning indicator circuits. Volume is adjusted by means of the 47k preset pot. The 4.7uF tantalum capacitor is required to ensure stable operation of the audio indicator.

FOR THE PAST 20 YEARS WE HAVE CATERED FOR TOMORROW'S ELECTRONICS ENGINEERS.

E.D. & E. (SALES) PTY LTD

Now trading as

KITS ALL ELECTRONIC COMPONENTS KITS

COME TO THE PEOPLE WHO SPECIALISE IN KIT SETS

***NOW** at last we have received stocks of Negative Photo Resist "coated copper" on fibreglass board.*

No pre or post baking required. Just place negative in contact, add U.V. light, develop and etch a beautiful P.C.B. All your own work. All chemicals available.

You asked for it — here it is!

Fantastic new inverter from E.A.

Ideally suited for remote locations, outback areas, boats, yachts, vehicles, etc, where regular A.C. power supply is unavailable or unreliable.

E.A. 12-230V inverter kitset (See E.A. Feb. '79)
Input 12V D.C., Output 230V at 50Hz. 300VA — $195.50 inc. tax.

Look no further for your D.C. power requirements. The new E.T.I. 142 power supply kitset will cater for most needs.

0-30V, 0-15 Amp., fully protected and dual metering (See E.T.I. Feb '79) — $240.65 inc. tax.

YOU NAME IT — WE'VE PROBABLY GOT IT!

WE HAVE ... one of the biggest ranges of kits, parts & P.C.B.'s in Australia.
WE HAVE ... over 300 different types of I.C.'s.
WE HAVE ... over 250 different types of transistors.

ONLY "RECOGNISED BRANDS" STOCKED

TOP QUALITY & LOW PRICES

SPECIAL SERVICE FOR SCHOOLS — EVERYTHING THE YOUNG ELECTRONIC STUDENT WOULD NEED

INQUIRE ABOUT OUR MAIL ORDER SERVICE

WE STOCK A COMPREHENSIVE RANGE OF TOP QUALITY P.C.B.'s FOR E.A. & E.T.I. PROJECTS (For full list refer to E.A. November 1978)

FOR FULL LIST OF KIT SETS REFER TO E.A. JANUARY 1979

ALL ELECTRONIC COMPONENTS

TELEPHONE 662-3506

THE FAMILY BUSINESS

118 LONSDALE STREET, MELBOURNE 3000

TELEPHONE 662-3506

Car Headlight Warning

Ever left your car's headlights on and returned later to find a flat battery? At best this situation is inconvenient; at worst it's dangerous and expensive. A warning circuit to indicate when the car's lights have been left on can save you time and money.

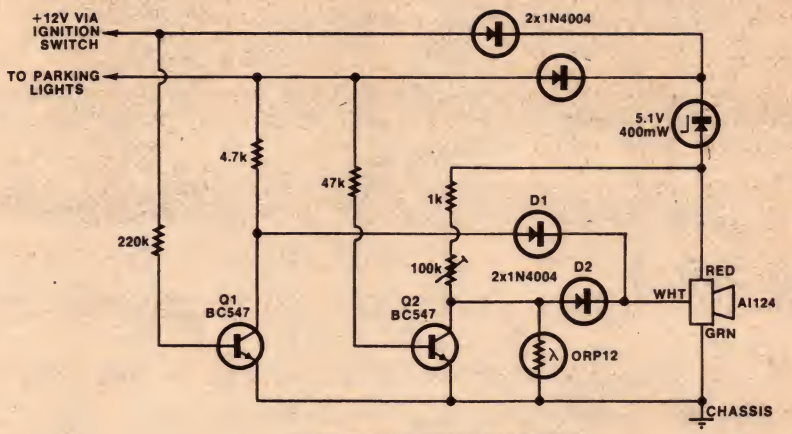
The circuit described here has two functions. First of all, it monitors the ambient light level and, when this falls below a preset level, sounds an alarm to indicate that the headlights should be turned on. Secondly, it will sound the alarm if the engine is stopped with the headlights (or parking lights) left on.

Refer to the circuit. It's really very simple and uses two transistors, five diodes, an ORP12 LDR (light dependent resistor), and an AI124 audio indicator. No alteration to the car's existing wiring is required.

When both the headlights and the engine are on, transistor Q1 conducts, effectively shorting the audio indicator input to earth via D1. Turning the engine off turns Q1 off, forcing its collector high and turning on the audio indicator. The indicator can then only be turned off by turning off the headlights.

Automatic light level sensing is provided by the LDR. In daylight, its resistance will be low and the AI124 audio indicator will be held off. The resistance of the LDR increases as the light level decreases until, at a critical point, the audio indicator is turned on. Turning the headlights on will now turn transistor Q2 on, and the audio indicator off.

The trimpot in series with the LDR is adjusted so that the alarm will sound at the desired light level.



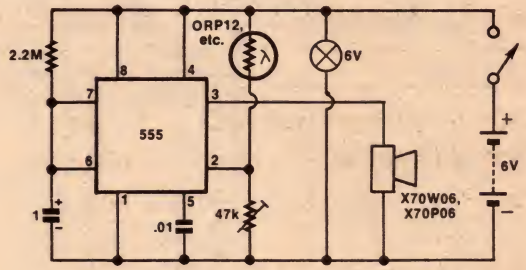
CAR HEADLIGHT WARNING

Light beam door-entrance alarm

Need a light beam door entrance alarm? Our circuit uses a 555 timer IC, wired as a monostable in a manner similar to the capacitance activated buzzer described below. A 6V torch globe, an LDR, an X70W06 audio indicator, and a handful of other components complete the circuit.

In use, the unit is usually set up with the light source on one side of the doorway, and the LDR on the other side. When the light path between the two is interrupted, the resistance of the LDR suddenly increases, triggering the timer via pin 2 and forcing its output (pin 3) high to drive the audio indicator. This arrangement ensures that the audio indicator will stay on for around 2.4 seconds, no matter how brief the interruption time was.

For most applications, it will be necessary to provide a light source with a suitable reflector, in order to achieve the necessary path length to the LDR. A low cost torch would be ideal for the job. The 47k trimpot should be adjusted for reliable triggering.



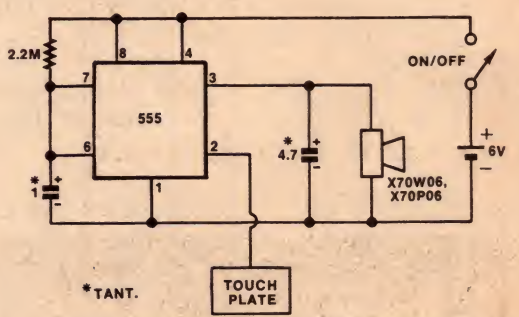
LIGHT BEAM ALARM

Capacitance activated buzzer

A proximity switch or a capacitance activated door buzzer — call it what you will. You can use this circuit as a door buzzer for the home, as a shop counter buzzer, or as an inter-office buzzer.

The circuit uses a 555 timer IC wired as a monostable, with a metal touch plate connected to the trigger input (pin 2). Normally the 1uF tantalum capacitor is held discharged by a transistor inside the timer. When a hand touches the metal plate, the increase in capacitance between pin 2 and earth sets an internal flip-flop, releasing the short circuit across the capacitor and driving the output (pin 3) high.

The capacitor now charges via the 2.2M resistor. When the voltage across it reaches 2/3 the supply voltage, a comparator (inside the 555) resets the flip-flop which in turn rapidly discharges the capacitor and drives the output low.

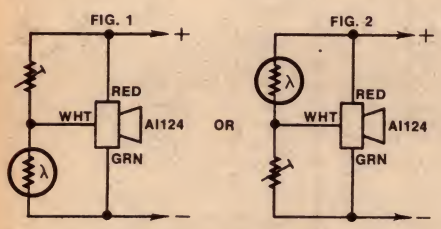


CAPACITANCE ACTIVATED BUZZER

Touching the touch plate will now cause the cycle to start all over again.

The length of time that the output is forced high (and hence the length of time that the buzzer sounds) is around 2.4 seconds. This depends on the time constant of the 2.2M resistor and the 1uF tantalum capacitor. Increasing the value of either component will increase the length of time that the buzzer sounds.

Low-cost sensor with alarm



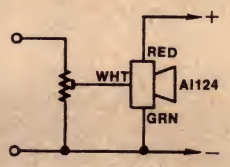
LOW-COST SENSOR

Here are two very simple circuits that can be used to indicate a variety of alarm situations, merely by changing the sensor R1. For example, R1 could be an LDR, a thermistor (to sense temperature), or a liquid probe. R1 and the preset pot are simply used as a voltage divider, which turns the AI124 audio indicator on and off.

You will notice that there are two circuits, each for a different situation. The circuit in Fig.1 will sound the alarm only when the resistance of R1 increases to a preset level; the circuit in Fig.2, on the other hand, sounds the alarm when the resistance of R1 decreases to a preset level. The preset pot sets the circuit sensitivity, and its value chosen to suit R1.

Typical circuit applications include a temperature alarm, a liquid level alarm, and a low-cost light beam door entrance alarm. By using a thermistor for R1, for example, the circuit in Fig.1 could indicate the failure of a heating element, while Fig.2 could indicate overheating equipment. By replacing the thermistor with a liquid probe, Fig.1 could indicate liquid drop in a tank while Fig. 2 could indicate when the tank was full.

Preset voltage sensor



Essentially a variation on the two circuits shown above, this circuit is used for detecting preset voltage levels. It can be used as an under- or over-voltage detector on power supplies, or can be connected to fuel, oil and temperature gauges in a car to give a warning at a preset level. When used in the latter application, a 5 volt zener diode (C5V1) should be inserted in the positive supply line so that the voltage rating of the AI124 (7V max) is not exceeded.

Where to buy audio indicators

Buy your audio indicator from Instrument Technics, PO Box 224, Doncaster, Victoria 3108. Prices (including 15½% sales tax), are as follows: AI124, $2.29; AI254, $4.31; X70W06, $9.76; X50W12A, $19.99. Add 60c each for postage and packing. Also available from the following distributors: Delsound (Brisbane); Protronics (Adelaide); Radio Parts (Melbourne); Magrath (Melbourne).

AUDIO INDICATOR SPECIFICATION TABLE

PARAMETER	COND	AI124			AI254			X50W12A			X70W06			
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
SUPPLY VOLTAGE (Vcc)		3	5	7	3	12	16	6	12	20	3	6	12	VDC
SUPPLY CURRENT (Average)	Vcc = 3V		16	21										mA
	Vcc = 6V								10	13		8	12	mA
	Vcc = 7V		34	45										mA
	Vcc = 12V					4	6							mA
	Vcc = 20V								47	55				mA
SUPPLY CURRENT (Peak)	Vcc = 3V		43	50										mA
	Vcc = 6V								43	53		60	100	mA
	Vcc = 7V		95	110										mA
	Vcc = 12V					40	70							mA
	Vcc = 20V								130	150				mA
FUNDAMENTAL FREQUENCY	Vcc = 5V	270	375	550										Hz
	Vcc = 6V										2.8	3.2	3.6	kHz
	Vcc = 12V				3	4	5	2.3	2.7	3.1				kHz
SOUND PRESSURE LEVEL	Vcc = 3V	67	80											dBa
	Vcc = 6V							100	110					dBa
	Vcc = 7V	72	83											dBa
	Vcc = 12V				75	89								dBa
	Vcc = 20V							105	116					dBa
CONTROL CURRENT (Average)	Vcc = 3V	0.58	0.67	0.80										mA
	Vcc = 7V	1.5	1.8	2.0										mA

"ELB WORKS"

When a company is bold enough to promise up to 25% better mileage for its cars then it must expect to be fair game for government and, more especially, the sceptical motoring writers. But that's just what Chrysler did when they launched the 1979 Regals and Valiants with Electronic Lean Burn. ELB literally puts a Solid State Computer under your bonnet . . . that accurately monitors throttle position and sets the precise timing of the spark. Result: an engine which is easier to start, more responsive and far more economical. Unlike design or decoration, the results of ELB are real. They can be measured exactly. Does ELB work? Here's what Australia's motoring writers found.

"Was the fuel gauge wrong?

. . . It was a most surprising experience this week to have to tap, tap on the fuel gauge of a brand new car to make sure it was working.

Yet this was the case after driving more than 100kms in a big, heavy, six-cylinder 4.3 litre capacity 1979 Valiant equipped with Chrysler's Electronic Lean Burn system. The gauge just sat right past full. Was the gauge wrong?

No. The Valiant returned the amazing economy figure of 13 litres per 100km, or 21 mpg. And this was for mainly city, suburban driving a test vehicle operating mainly with air conditioning.

It was 28% better than the superseded car's performance."

John Clydesdale, The Sunday Times, Perth

"Enter the six-pot petrol sipper

I have just driven back from Adelaide in an automatic four-litre full-size current model Valiant. It averaged 25.09 miles a gallon (11.2 litres to 100 km).

And, crewing with Sydney motor writer Phillip Christensen, we didn't spare the horses. There was no pussy-footing it economy-run style—we drove up to the speed limit when it was safe to do so. The 760 kilometres (472 miles) was done in 8.5 hours, an average of 89.4 kmh (55.5 mph)."

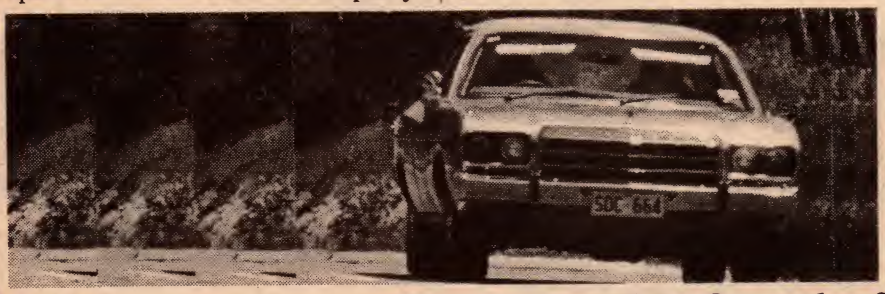
Bryan Hanrahan, The Melbourne Herald

"Valiant's victory run

. . . Although hampered by the climb and traffic the GLX won the economy battle with the excellent figure of 9.33 litres/100kms (30.2 mpg). The manual GLX was by far the most frugal car on the run as indicated by the Adelaide-Sydney averages. The GLX averaged 10.49 litres/100kms (26.9 mpg) the Valiant 4.0 litre auto 10.73 (26.3) and the Regal 4.3 auto 11.17 (25.3).

. . . No matter how you look at these figures they are excellent . . . More than that, these figures are realistic, recorded under normal conditions encountered by the average motorist every day, not on a dead flat test track."

Wayne Webster, Sydney Daily Telegraph



This curious device, exclusive to Chrysler, can give you up to 25% better mileage. And that's a serious consideration these days.

"Chrysler's way to beat the fuel crisis.

Chysler has achieved a major breakthrough in petrol economy with its new computerised ignition system now under investigation by the Federal Government.

Its latest six-cylinder Valiant—which I've just tested—returned an impressive 13.1 litre/100km (21.3 mpg) in city and suburban driving. This was much better than the company's claim of 14.6 litre/100km (19.4 mpg) in urban use.

. . . It is the most economical six-cylinder Australian car I've driven since the introduction last year of the controversial anti-pollution legislation . . ."

Mike Kable, Sydney Daily Mirror

"Chrysler's economy no gimmick

I've just proved that Chrysler Australia's claims are true for its space-age computerised fuel economy system.

Around Sydney I got an incredible 13.7 litres per 100km (20.6 mpg) from a 4.3 litre six-cylinder Chrysler Regal automatic complete with power steering and air conditioning.

The Chrysler Electronic Lean Burn System is, I believe, much more than a gimmick. It works."

David Robertson, Sydney Morning Herald

"Chrysler Australia's claims are true."

Sydney Morning Herald

Y&R AV743

CHRYSLER AUSTRALIA LTD.

DICK SMITH ELECTRONICS

is proud to present your FREE copy of the new 1979 Jumbo Catalogue

You'll find the 1979 Jumbo Catalogue more than a catalogue – it's also a wealth of information, data, etc, bringing you right up-to-date with the 'state of the art' in hobby electronics in Australia.

As it says on the cover, Dick and his staff have searched the world to bring you the best products at down to earth prices.

You'll find many exciting new products spread through the 104 pages of the catalogue.

Most of the products shown should be available from Dick Smith Electronics company-owned stores throughout Australia. Some products are on order, with stocks expected shortly. They have been included in the catalogue so you'll know what's coming in the near future.

Most of the lines will also be available through Dick Smith dealers. As these dealers operate as completely independent businesses, and also they have to absorb a significant amount of sales tax in their business, prices may vary slightly from those shown in the catalogue.

You'll find a store or dealer close to you in most areas of Australia; however, our Mail Order Centre is always ready to serve you if you find it inconvenient to shop personally at one of our stores or a dealer.

DID SOMEONE BEAT YOU TO IT?

No worries, there are plenty of catalogues to go around. Just send the coupon below with 75¢ to Dick and he will send you one. Normally $1.05 (inc. postage) — yours for 75¢ during April only!

To Dick Smith Electronics,
PO. Box 747, Crows Nest 2065.
Dick, I missed out (or I'm greedy and want another one). Here's 75¢ for packing and post. Send one of your infamous catalogues to:

NAME .....

ADDRESS .....

..... P/CODE .....

TO REMOVE YOUR CATALOGUE, SIMPLY PULL OUT OF THE MAGAZINE FOR FUTURE REFERENCE AND RECLOSE MAGAZINE STAPLE. DO IT NOW!

Circuit & Design Ideas

Conducted by Ian Pogson

Interesting circuit ideas and design notes selected from technical literature, reader contributions and staff jottings. As they have not necessarily been tested in our laboratory, responsibility cannot be accepted. Your contributions are welcome, and will be paid for if used.

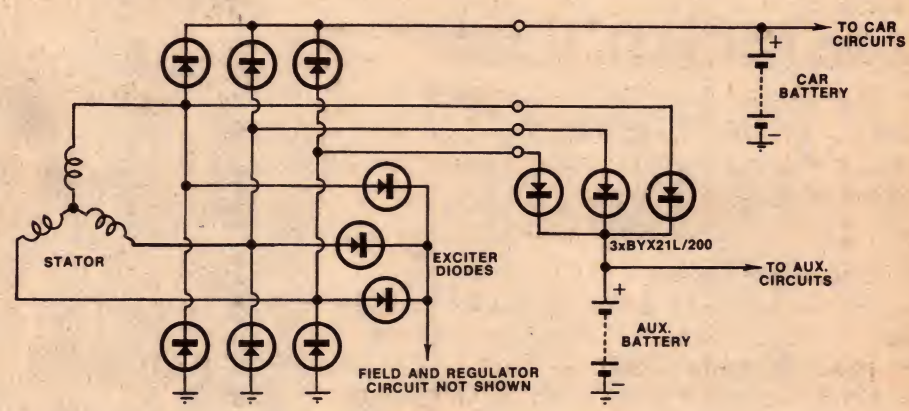
Caravan DC power — a better way

In the past I have been asked to instal an auxiliary batttery to a car for supplying power to a caravan. The auxiliary battery was to be isolated from the car battery to prevent the car battery from discharging when power was being taken from the auxiliary battery. My first installation used the same circuit as commercially available. I found this method to have a number of disadvantages and so I have since used a method of my own which I have never seen used elsewhere.

As may be seen from the circuit, the battery charging circuit has not been interfered with in any way. As a result of not adding any series diodes, the voltage regulation of the alternator is as standard, giving a good battery charge even when towing a caravan at night. Another benefit is that only the auxiliary battery current flows through the isolating diodes, allowing the use of a smaller heat sink.

With this method it is however necessary to bring out the three AC wires from the alternator. This is quite simple to do, but some care must be taken. To do this I mounted a three hole Belling Lee terminal block on the side of the alternator. This allows the alternator to be removed at any time without having a long loom hanging from it. It is not necessary to use the large electrician's terminal block, the size used in radio projects is sufficient.

Before removing the alternator, decide the area in which the block should be located for ease of getting a screwdriver in to fasten the loom. After removing and disassembling the alternator, find a position where holes can be drilled and tapped without damaging the internal components of the alternator. Drill and tap the two mounting holes (I used 6BA) and fasten the block to the side of the alternator.



Now locate the three stator winding ends. These will be where the diodes are connected. Solder on three wires to bring the AC out and feed them through the rear venilation hole. I used 23/.0076" wire. Route the wires close to the case so the field (rotor) will not catch them. Remember to retain the brushes when reassembling the alternator. There is a hole behind the brushes for holding them with some stiff wire.

The diodes are mounted on a heatsink insulated from chassis. A 3 or 4 inch heatsink will be sufficient, as not much heat is produced. I used press fit diodes and insulated the heatsink, but stud mounting diodes with mica washers would allow the heatsink to be uninsulated. Use heavy wire to connect to the battery. I used 70/.0076".

The battery may be located in either the car or the caravan. If the battery is in the caravan, power may be used while the car is disconnected but when the caravan is not being used the battery should be charged periodically. If however, the battery is mounted in the car it will be charged whenever the car is running. It will however be necessary to have the caravan cable connected to the car to get power.

To summarise the advantages and disadvantages of each system, the earlier one has the advantage of being useable with a DC generator but the disadvantages are poor voltage resultion, large heatsink in well ventilated situation required, and wiring modifications to the battery charging circuit are necessary. With the new system, the advantages are that the car battery circuit remains as standard, voltage regulation remains standard, and only a small heatsink required. The disadvantages are that it cannot be used on cars with a DC generator, and disassembly of the alternator is required.

(By Mr S. Farmer, 32 Keartland Street, Page, ACT 2614.)

Handy aid to fine soldering

It is possible to reduce the difficulty of fine soldering on circuit boards by fitting the solder into a mechanical pencil. I use a Pentel P209 0.9mm pencil which accepts Ersin Multicore solder, 0.9mm BS219 grade K, as readily as the intended graphite leads. The pencil costs about $4.00 and is available at most stationery stores.

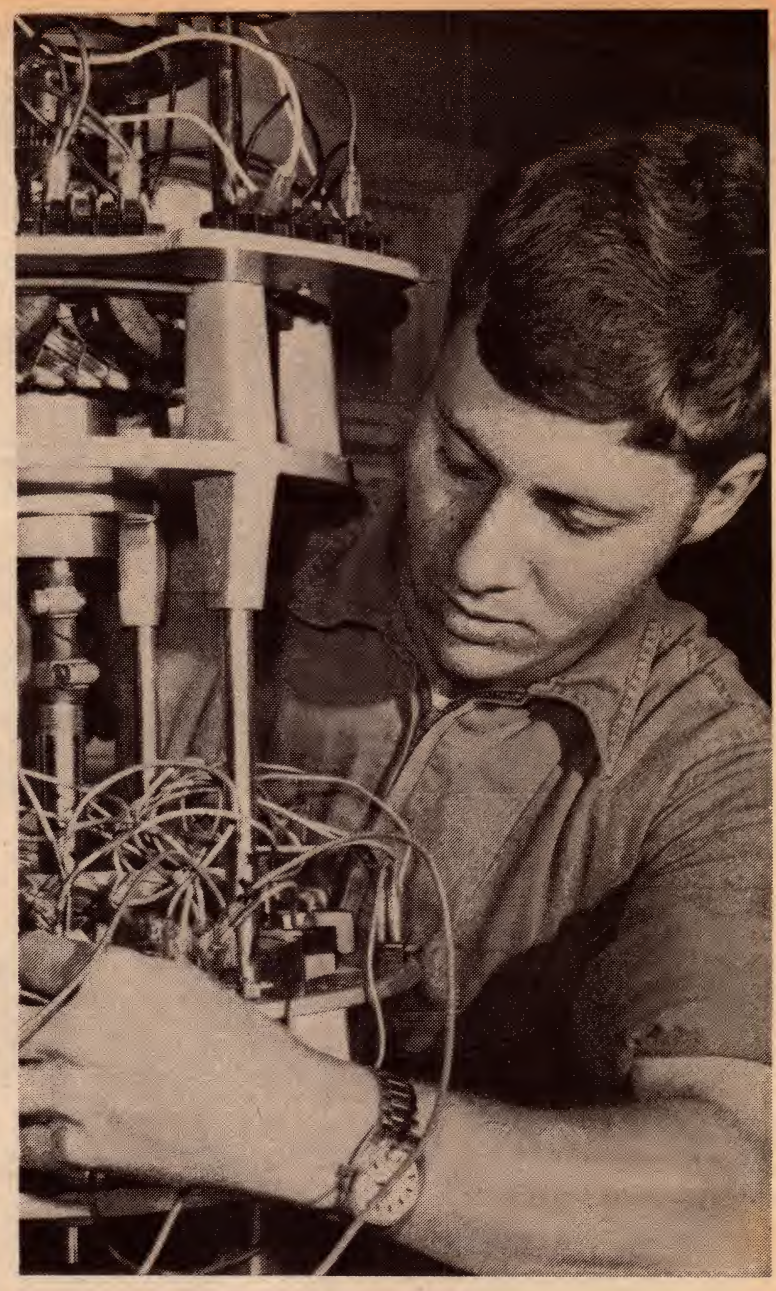
The pencil provides very positive control both as to the point at which the solder is applied and the amount of solder used. I find that extending the solder about 6mm out of the pencil tip is advisable as this provides sufficient solder for a typical joint without melting the solder right back to the tip. The tip is stainless steel and the solder does not adhere to it. However, the resin flux does and it is necessary when this happens to unscrew the tip to free the solder.

The solder must be cut into lengths of 125mm maximum and firmly rolled between two flat pieces of metal, to straighten it and remove any kinks. Hand pressure is sufficient as the solder is very malleable.

(By Mr P. Lees, 5 Garvey Street, Bentley, WA 6102.)

Army Apprenticeships

Opportunities for young men (15-17*) in the Electronics and Electrical Trades.



ELECTRONIC TRADESMEN • ELECTRICAL MECHANICS • ELECTRICAL FITTERS

The Army wants young men to enlist as Army Apprentices to be trained as

- Electronic Tradesmen in the field of electronic communications.
- Electrical Mechanics in the field of high and low voltage electrical generation, reticulation and distribution systems.
- Electrical Fitters in the fields of electronic devices, electrical control equipment and domestic electrical systems.

The 9 years enlistment period will include a 4 years apprenticeship at the Army Apprentice School at Balcombe in Victoria and in Army technical units (leading to civilian trade qualifications) and 5 years further training in the Army corps of Signals, Electrical and Mechanical Engineers or Engineers as appropriate.

Applicants should be successfully studying English (or its equivalent), Higher Maths, Science and at least 2 other subjects at Year 10 or 11 School level. They will be required to present documentary evidence of successful results of their previous completed School year at formal application.

It is important to understand that the number of applications that can be accepted is very limited. If you're interested, don't wait or you will miss out. Fill in this coupon or phone an Army Apprenticeship Counsellor.

Brisbane 226 2626; Townsville 71 6784; Sydney 212 1011; Newcastle 2 5476 or 2 4728; Wollongong 28 6492; Canberra 82 2333; Melbourne 61 3731; Adelaide 223 2891; Perth 325 6222; Hobart 34 7077.

**Applicants must be at least 15 years old but still under 17 years old on January 1, 1980. If you are over 17 years you may apply to join the Army Adult Tradesman Scheme as an Electronic Tradesman trainee.*

Authorised by the Director General of Recruiting, Dept. of Defence.

For further information, post this coupon.
To: Army Apprenticeships Counsellor, G.P.O. Box XYZ
(insert name of your nearest capital city and postcode)
Please send me details of ☐ Army Electronic and Electrical Trades Apprenticeships ☐ Adult Electronic Tradesman Trainee.

NAME: _____

DATE OF BIRTH: _____

ADDRESS: _____

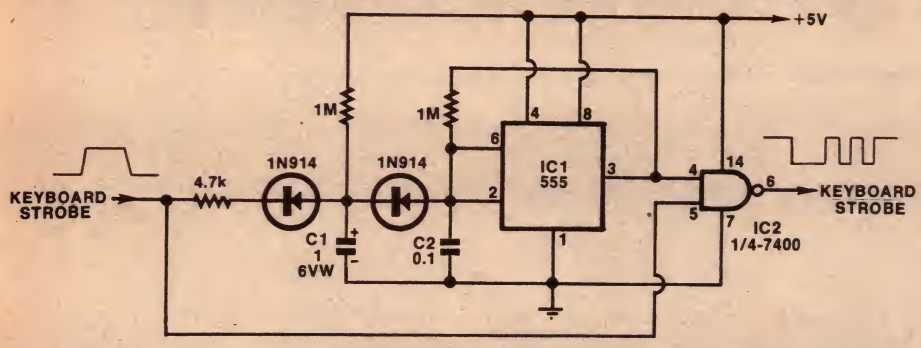
_____ POST-CODE: _____

Join the Army

We're looking for more good men.

AAE40.FP.19

Auto repeat for keyboard



This circuit can be adapted to any keyboard which has a strobe for the duration of key closure. As drawn, the strobe line is assumed to be normally an "O", going to a "1" after the keybounce delay time and remaining so until the key is released. C1 and C2 are both held close to zero volts so pin 3 of IC1 is a "1".

When a key is pressed, the strobe line becomes a "1" and pin 6 of IC2 goes low. If the key is released within one second, then pin 6 of IC2 will reset to a "1" and only one pulse will have been output from the circuit. However, if a key is held pressed for longer than one second, then IC1 will start to oscillate at about 10Hz and pin 6 of IC2 will pulse at that rate.

(By Mr W. Gummerson, 13 Hindmarsh Road, Liverpool, NSW 2170.)

Another hee haw siren for toys

The ingenious design of Mr A. Ohsberg as given in Circuit & Design Ideas in October, 1976 provided the basis for this circuit. There are three major differences.

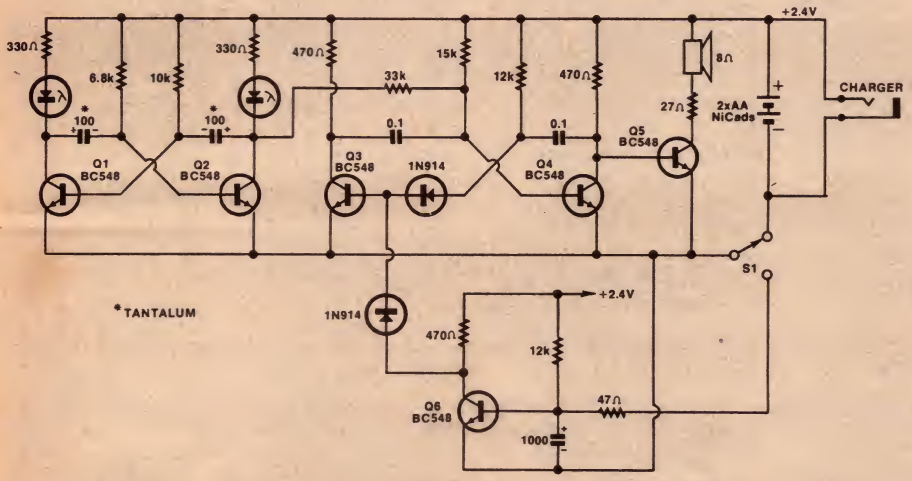
First, battery voltage is provided by two "AA" type nicad cells which provide a nominal 2.4 volts. This allows the batteries to be built in for the life of the toy and with correct recharging is eventually cheaper than replacements of carbon-zinc or alkaline types.

Second, the multivibrators are asymmetrical to more closely match the sound of fire sirens. The high frequency tones are a compromise between realism and the noise least dissonant to parental ears.

Third, Q6 turns off the siren but allows the LEDs to continue flashing. Q3 base is switched by Q6 to ensure that Q5 collector goes high when the siren stops, so reducing battery drain. S1 switches the unit on or discharges the 1000uF capacitor which with the 12k resistor sets the time constant for turn on of Q6.

The siren and LEDs unit has had continual use for about 20 months at the time of writing, the only failure being the coil of the old speaker first used.

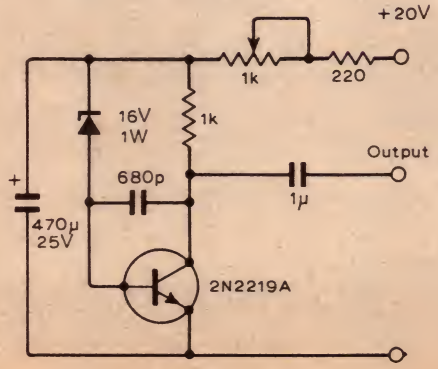
(By Mr E. C. White, 36 Lionel Street, Christchurch 6, New Zealand.)



Simple noise generator

The circuit shown was used as an emergency noise generator because it can be assembled quickly. Noise from this generator falls in the audio range and the wideband level is over 1V, adjustable to zero by the potentiometer. Without the 680pF capacitor the noise extends up to 30MHz with a wideband level of more than 5V. If lower zener and supply voltages are used, the noise level is reduced drastically.

(By D. Di Mario, in "Wireless World".)



Bill Edge's Electronic Agencies

115-117 PARRAMATTA ROAD, CONCORD 2137. 7476472.

Apart from our normal trading hours: i.e. 9am-5.30pm Mon-Fri, 9am-noon Sat, we will now be open from 10am-2pm on SUNDAY — for all you hobbyists who are in the middle of a job and find you need a resistor or IC to finish off — and you have to wait till Monday — well now you don't.

We are willing to listen to your special requirements.

Semiconductors, Resistors, Capacitors — you name it — we have over 2000 lines and rapidly expanding — why not try us and be pleasantly surprised. We have no catalogue and therefore can afford to give you the best possible price.

MAIL ORDER: Our mail order has surpassed all expectations and we'd like to thank all those people who have given us a try and stayed.

If you haven't tried us yet you may not be getting all your requirements — after all we are prepared to chase up and order in a special device for you.

The Serviceman

Power line hash: what every serviceman should know

One of the most frustrating forms of interference to both radio and television reception is the hash radiated from power lines, particularly of the high voltage variety. Adding to the frustration has been the fact that, for a long time, the beleagured listener/viewer has had little assurance that the responsible authorities have even taken the problem seriously!

During my boyhood in the country, interference from the gradually expanding network of power mains played havoc with the generally weaker radio signals of those days and continued to do as I later moved into the radio and servicing game. When I did, I realised that there was a new twist to the problem: that of trying to convince customers that the trouble was not inherent in their sets, but due to the power lines nearby.

My attempts to sheet home the blame were generally not helped by the supply authorities who, when approached, reacted all the way from denying responsibility entirely, to a grudging admission that the power lines were responsible — but coupled with a "we can't do anything about it" attitude!

As far as radio signals were concerned, it was largely a "country" problem; signals in the city and suburbs were usually strong enough to drown it. Later, when radio stations increased their power substantially, and local stations came on air, the problem was alleviated in a great many country areas, and was largely forgotten.

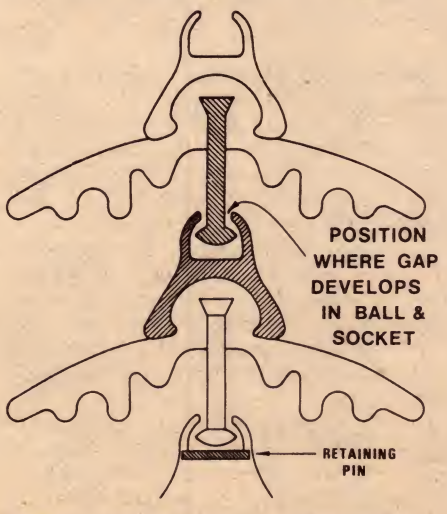
That is, until the advent of TV; then it suddenly raised its ugly head again. This time, in place of a background of hash which did its best to drown the radio programs, there were bands of black dots across the picture. There were — and are — normally two bands per picture, drifting slowly up or down the screen, depending on the precise relationship between the mains frequency and the field scanning rate.

In bad cases each interference band can occupy a quarter of the screen; it can cause horizontal pulling and can trip the vertical sync every time it drifts out of the picture into the vertical blanking period. It can also penetrate the sound channel. Even if it does not reach these extremes, it can still be very annoying.

Almost as soon as the problem was encountered, in the early days of TV, another fact was noted: its dependence on the weather. You may well have observed it yourself.

Within minutes of the onset of rain the problem will vanish and remain "cured" while ever the rain continues. When fine weather returns it may be several days, even weeks, before it appears again.

On the other hand it is aggravated by the humid conditions which often occur with the drop in temperature at sundown. Similarly, the onset of rain will often trigger it for a few minutes, before it vanishes completely. Again, while very high humidity will trigger it initially, it will often cure it after an hour or so.



Construction of the disc type insulator string, showing the ball and socket joint where the spark gap develops. Bonding these two metal pieces is one suggested cure for the problem.

It is normally worst on the low frequency channels (channel 2 in Sydney) though the other channels are by no means immune. Also, for some reason which I cannot yet explain, colour sets produce white dots instead of black.

Nor is it a fringe area problem, as in the radio days. It occurs in the Sydney metropolitan area before the boundary of the primary service area is reached. In fact, it is probable that only those viewers within eight or 10km of the transmitters — and with a reasonable location — enjoy certain immunity from it.

As with any such problem, it was inevitable that various theories would be advanced to explain it. And, of course, the observed effects of rain have been included in such theories. The first, as I recall, was the "dust on the insulators" theory, the reasoning being that the dust provided a leakage track across the insulators and it was this leakage that caused the interference. Naturally (it was reasoned) when the rain washed the insulators, the problem vanished until another layer of dust accumulated.

The opposing theory was the "loose hardware" proposition. This was more complex but, briefly, suggested that any two pieces of metal in loose contact, in the strong field adjacent to the power cables, could produce small sparks between them. (The "V" shaped cross-arm supports were the most blamed culprits.) The effect of rain was explained in two ways; initially it would penetrate the space between the metal pieces, thus preventing the spark. Longer term, it would expand the wood (pole and cross-arms) temporarily clamping the previously loose metal.

Most likely, the very persistance of these two theories was indication that the nature and source of the interference was not well understood by the authorities themselves. This, as much as anything, may have accounted for their apparent inertia in dealing with the problem at its source.

If you're wondering what brought all this on, the answer is simply an article

which, at long last, appears to spell out the reasons for the RF interference caused by high voltage powe lines. In so doing, it offers hope for those who have had to live with the problem, maybe for years.

The article appeared in "The Proceedings of the Institution of Radio and Electronics Engineers Australia", December 1978, and is entitled "Interference to VHF TV Services from Overhead HV Power Lines". It is by Mr. R. G. Aujard, AMIREE, of the Victorian State Electricity Commission.

I must add that "The Proceedings" is not normally my idea of required reading for TV servicemen. Whenever I do happen to thumb through a copy, it seems to be filled with pages of (to me) complicated mathematics, punctuated with an occasional "thus", "therefore", or "as a result". Great stuff if you're trained for it, but not for us working blokes!

But this article is very much an exception. I consider it should be required reading for any serviceman who has ever encountered power line interference (and who of us haven't?). And, as well, for engineers of the various power supply authorities. (Who knows, they might learn something!)

Having read the article, it did not surprise me to find that the author's background extends far beyond the 50Hz of power supply engineering. In fact, he commenced his career with the ABC in the studios and at Radio Australia (he holds a first class operator's certificate), spent some time with DCA as a radio operator, joined the State Electricity Commission of Victoria in 1949, moved to the PMG Research Laboratories in 1951, and rejoined the SEC in 1961.

Which isn't a bad place to start from for a problem like the one in question.

Not the least gratifying aspect of this article is the simple fact that it has been written. At long last somebody cares; and cares enough not only to investigate the cause, but to produce several very practical suggestions as to how the source may be tracked down and cured.

As I intimated earlier, any serviceman with this problem, should read this article. Among other things, it will put you on level pegging with — or even a bit ahead of — the supply engineers you may elect to approach in search of help.

In the meantime here is a summary of the major points which the author makes. (Incidentally, it looks as though our theorists can call a truce; both were half right! Dust is involved, and so is loose hardware, but it is a lot more complex than either group appeared to allow for.)

The author goes right back to basics and reminds his readers of the old-time spark transmitter, in which resonant circuits were shocked into oscillation by a deliberately generated arc or spark. Signals from these primitive transmitters opened up the airwaves in the pre-valve era.

He then goes on to explain that the components in a power line system form themselves into rudimentary resonant circuits. The metal components (conductors, braces, pins, bolts, etc) fill the role of inductors, while the non-metal items (insulators, cross-arm, poles, etc) contribute as dielectrics to the capacitive elements.

Much of this hardware is subjected to an intense 50Hz electric field, with the voltage distributed randomly across the various dielectrics. When the voltage across some point in this dielectric chain causes it to break down, sparking occurs which can excite the resonant components into a damped oscillation. Commonly, one or more of the damped oscillations are superimposed on each half-cycle of the mains voltage.

The author makes the point that such interference is spread over a wide frequency range, due to the presence of multiple (and random) tuned circuits, but frequently peaks in the 40 to 50MHz range, tapering off around 100MHz. However, there are cases where it is has extended as high as 1000MHz.

This tendency to peak around 40 to 50MHz was given considerable emphasis with the establishment of a TV station on channel 0 (45 to 52MHz) in Melbourne in 1964. Although not mentioned, I imagine the same situation would apply equally to channel 0 in Brisbane.

(As a matter of interest, the Author points out that suburban street mains exhibit resonance characteristics related to the the length of the conductors forming each span. In suburbs with, typically, 150ft spans, spark excitation of the line may produce an interference peak around 3.3MHz, with lesser peaks at frequencies representing higher harmonic modes. In the country, with longer spans, the first peak may occur in the MW broadcast band.)

Having accepted that we have crude resonant circuits, and that these can be excited by a spark, it remains to explain how and where the spark occurs. Dare I say, "dust on the insulators"? "Dust In the insulators" would be more accurate, but dust is certainly to blame.

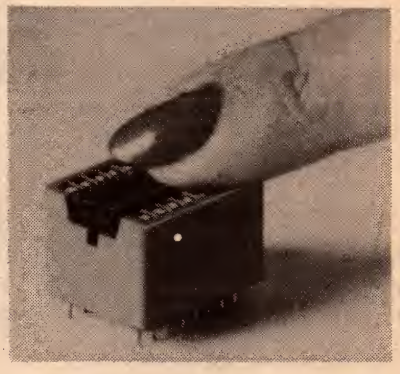
The main culprit would appear to be the disc type insulator; the type which can be made into a string by joining together as many disc units as required. The discs are connected by a ball and socket joint and it is here that the trouble occurs.

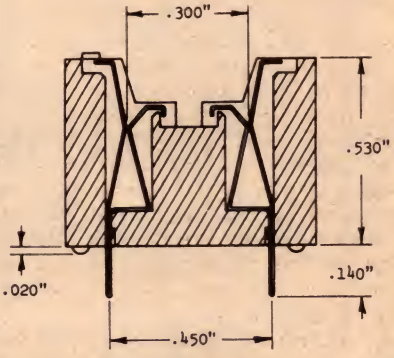
While ever the ball and socket make good metal-to-metal contact there is no problem. However, when they become separated by a small distance they constitute a potential spark gap and this, in fact, is where the spark commonly occurs. The cause of the separation is a fine, continuous layer of dust.

More specifically, it is a particular

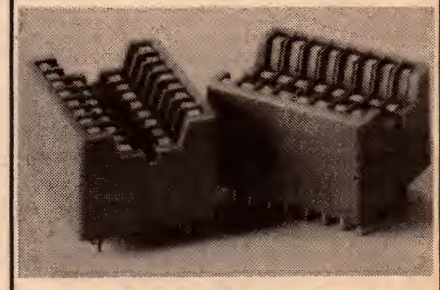
ROBINSON NUGENT, INC

TEST/BURN-IN SOCKETS





Designed to provide a low-cost alternative to complex, costly "Zero" insertion force units in production testing and burn-in applications. Excellent for working with PROMs.
Available with 14 to 40 pins.



GES

99 Alexander St, Crows Nest
439 2488

Adelaide 42 6655
Brisbane 277 4311
Canberra 82-3581
80 4654
Newcastle 69 1625
Perth 325 5722
Melbourne 598 9207

LEADER AUDIO FREQUENCY RESPONSE RECORDER LFR-5600

The LFR-5600 is a frequency response recorder designed to graphically record frequency response, wow-flutter, drift, voltage and temperature parameters of audio equipment.

The unit consists of two instruments: A pen recorder and audio sweep oscillator. The sweep oscillator may be used separately for direct reading of frequency response on an oscilloscope.

APPLICATIONS:

• Tape recorder / Cassette frequency & signal to noise ratio • Audio amplifier frequency response & signal to noise ratio • Cartridge frequency response • Wow-flutter & drift • Filter frequency response • Direct observation of low frequency response

For further information contact:—

FEATURES:

- Automatic start circuitry allows easy measurement of tape recorder response.
- Standard signal frequencies of 1kHz and 333Hz (with less than 0.1% distortion) may be selected for reel to reel or cassette recorder measurement.
- Selectable 25dB, 50dB or linear scales.
- Sweep oscillator output has 20dB and 40dB attenuation allowing high sensitivity measurements.
- External signals may be used for response checks.
- Meter may be used as sweep frequency indicator or input / output voltage indicator for voltage calibration.
- Chart section may be used as a direct current recorder (10 mV / cm).
- A slow speed range of 0.1 mm / cm allows long term drift measurements.

WF WARBURTON FRANKI

• ADELAIDE 356-7333 • BRISBANE 52-7255 • HOBART 23-1841
• MELBOURNE 699-4999 • PERTH 277-7000 • SYDNEY 648-1711
• AUCKLAND N.Z. 79-7781 • WELLINGTON N.Z. 698-272

WF 587/77

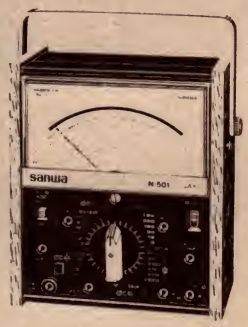
REAL POWER LINEUP

U-60D

44μA movement — quality performance, diode protected.
Temperature measurement of −30°C to +150°C with extra probe.

460-ED

10μA movement — 100kΩ/V varistor protected.
Polarity reversal switch — negative measurements.
Equalizing transformer — common shunts & jacks for 1.2A & 12A DC/AC



N-501

2μA suspension movement — 0.05mA/1mV resolution.
Double protection — fuse & Si diode.
Constant 1MΩ input impedance (ACV) — RF-diode rectified current direct to movement.

CAM-250D

Clamp meter
Economical and multi-function.
Single motion core arm.
Compact yet provides 4 ranges on ACA and 2 ranges on ACV

WF WARBURTON FRANKI

ADELAIDE 356-7333 BRISBANE 52-7255 HOBART 23-1841 MELBOURNE 699-4999
PERTH 277-7000 SYDNEY 648-1711 WELLINGTON, N.Z. 69-8272

sanwa

THE SERVICEMAN

type of dust; silica quartz (SiO_2) which the author identified using X-ray diffraction and X-ray absorption techniques. He explains how, by reason of sway in the line and consequent movement in the joint, it is possible for the quartz to be deposited over the whole of the metal surfaces, thus completing the separation. (Silica quartz is present naturally in the atmosphere, typically accounting for about 13% of airborne solids.)

The Author pinpoints the "slack span" as the place where the problem occurs most frequently, due to the fact that the insulators are subjected to minimum loading and maximum sway. He explains why slack spans have had to be provided under certain conditions of line configuration, particularly at corners.

He also nominates lines in the 11kV to 66kV as being the main offenders. Transmission towers are less likely to cause trouble by reason of the heavy conductors and the tension which they exert on the insulators; this, in turn, inhibits the accumulation of a quartz layer in the joints.

Having established the cause, the author then goes on to suggest ways of pinpointing offending insulators and how to treat them.

He discusses various methods of detection; RF radiation, mechanical shock, water spray, and ultrasonic listening devices. In regard to RF detection, he points out something which many of us already know; it doesn't have much going for it. In spite of the difficulties, however, he admits that some sources are correctly located using radio receivers.

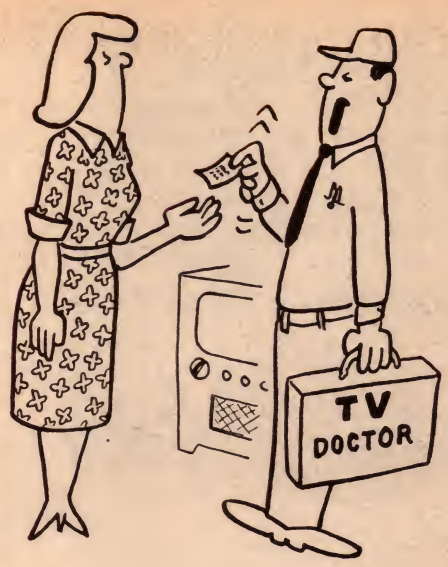
The mechanical method consists of prodding the suspect insulators with a long stick, while monitoring with a TV screen. Hitting the base of the pole with a sledge hammer is an alternative method of disturbing the insulators.

Since these faults are usually sensitive to moisture, the author suggests a technique of dribbling water onto suspect insulators from an (insulated) elevated platform.

As a matter of interest, your Serviceman conceived the same idea several years ago and even managed to persuade the council engineer involved to try the idea. While he was cooperative enough, the linesman he sent to do the job obviously regarded the whole thing as an exercise in ratbaggery. After spraying several poles without result they made the excuse that time had run out and that they would have to finish the job another day.

They never did come back, of course.

But what is possibly the most ingenious, the potentially most effective, approach is a supersonic listening



"Hand this note to the State Electricity Commission and watch them squirm!" (Adapted from "Radio-Electronics")

device. Working initially with a commercial unit, which was only partially satisfactory, the author devised a more sensitive unit which can detect a sparking insulator from the ground, even when the ball and socket opening is facing away from the detector. Fifty such units have been constructed so far, and show considerable promise.

But, having found the offending insulating string, how do you correct the situation? The author quotes two suggestions. One is to avoid slack spans and, as a logical extension of this idea, to deliberately load all spans with sufficient tension to prevent the growth of a dust film in the ball and socket interface.

The SEC have experimented with some of the suggested ways of tensioning the spans, but results so far have not been very satisfactory.

A second idea seems to offer more promise. This is to bond the ball and socket joint, thus preventing any spark from occurring across it. A New Zealand supply authority exploited this idea, using tinned copper braid, pop riveted to each side of the joint. Apparently it was quite successful and the SEC is currently assessing the idea with a trial installation in a Ballarat street.

So, to sum up, the article discussed the cause, various means of detection, and at least one form of treatment which is already being used with success. Which adds up to a pretty comprehensive discussion. Anyone who is suffering from this problem would be well advised to add this article to list of references, the better to counter the "fobbing off" technique so often encountered when the supply authorities are approached.

Copies of the November 1978 "Proceedings" are available from The Institution of Radio and Electronics Engineers Australia, Science Centre, 35-43 Clarence St, Sydney, 2000. The price per copy is $3.00 posted, in Australia.

STORIES FOR THE SERVICEMAN

With every passing year, the scope of electronic servicing grows wider and no one contributor can hope to cover it adequately. If you are engaged in electronic servicing of any kind, it is certain that you will have come across situations which other servicemen will find of interest.

Why not write the story in your own words and forward it to: The Serviceman, "Electronics Australia", P.O. Box 163, Beaconsfield NSW 2014? All stories adapted and used by The Serviceman will be paid for at our ruling contribution rate.

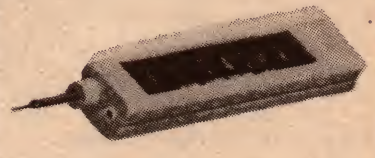
RADIO DESPATCH SERVICE

THE SPECIALIST STORE

869 GEORGE STREET, SYDNEY, NSW 2000. (NEAR HARRIS STREET)
PHONES: 211 0816, 211 0191

	LP-1	LP-2	LP-3	DP-1
Input Impedance	100,000 ohms	300,000 ohms	500,000 ohms	Output Tri State
Minimum Detectable Pulse	50ns	300ns	10ns	Autopolarity Pulse Sensing
Max. Input Signal (Freq.)	10 MHz	1.5 MHz	50 MHz	Sink and Source 100 ma
Price:	$44.95.	$24.95.	$69.95.	$74.95.

LOGIC PROBES & DIGITAL PULSER



P.P. 1.90

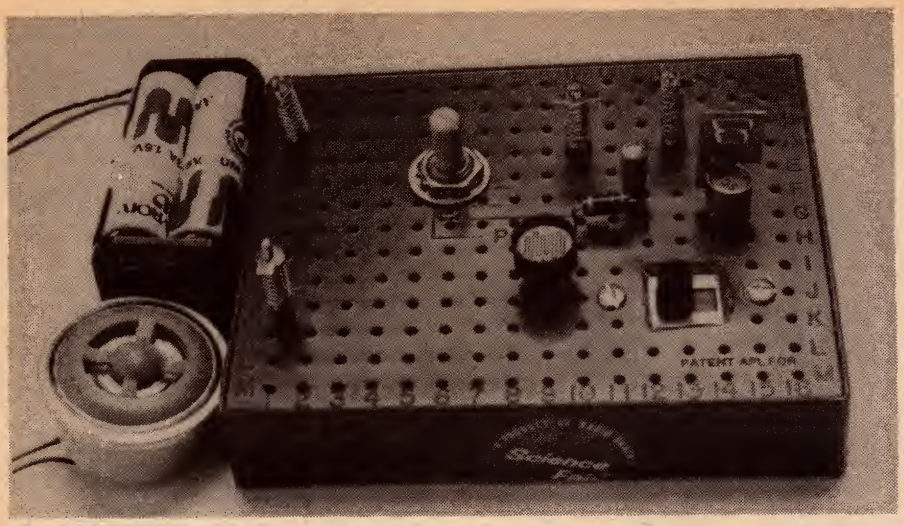
TI 59 CALCULATOR PRICE: $247.00 plus s/tax
TI PC100 PRINTER PRICE: $213.57 plus s/tax
TI 30 STUDENT PACK PRICE: $20.00 plus s/tax

SPECIAL FOR THIS MONTH
2144 RAMS PRICE: $9.86

SEE US FOR ALL TYPES OF VALVES
WE CAN SUPPLY ETI AND EA PC BOARDS, PACK CERT. POST $1.90

Distributors of Cannon plugs and connectors, edge connectors and Texas Calculators

Open: Mon.-Fri. 8.00 am-5.30 pm
Thursday late night shopping until 8.30 pm.
Saturday 8.00 am-11.45 am.



The simple intruder alarm as it appears when constructed from the Science Fair kit, as sold in Tandy stores. It can be built up in a more permanent form, however, and put to serious use. The layout is not critical and the parts can be arranged to suit each individual applications.

Especially for beginners:

A Simple Intruder Alarm

Here is a simple little project that can be built purely for its instructional value, or as a fun gimmick for the home. Alternatively, it could be built up in a more permanent form and put into service as a storeminder — alerting the owner whenever anyone enters the shop!

by WALTER NEVILLE

The idea behind the project is as old as it is useful: A narrow beam of light, as often as not shining across an open doorway, is focussed on a light sensitive cell. While ever the cell is thus illuminated, the associated circuitry remains substantially inert, hopefully drawing very little current from the battery, or other type of supply.

However, if the beam of light is interrupted, as by someone walking through the doorway, the circuitry is activated to sound an alarm, operate a signal light — or open a trapdoor in the floor, if you really wanted to!

Before the solid-state (or transistor) era, this kind of gadget involved a fair amount of circuitry. The light-sensitive element was usually a gas-filled phototube, constructed on the manner of an ordinary radio valve. The associated circuitry involved one or more amplifier stages, which required the provision of both a heater voltage and an anode supply voltage, typically of around 100 volts. This made it desirable to operate the unit from the AC mains, involving a power transformer, a rectifier and one or more filter capacitors. To operate the bell or signal light, some kind of relay was usually required in the valve anode circuit and, all told, it added up to a fairly complicated project.

The availability of solid-state devices has changed all that, making possible something as simple and straightforward as the project here illustrated. There is no phototube, as such, no amplifying valves or transistors, no relay, and no power requirements beyond what can be supplied by a modest battery.

Let's look at the circuit diagram:

In place of the one-time phototube is a cadmium-sulphide cell — in this instance a small cylindrical device measuring about 12mm in diameter and 6mm deep, with two wires protruding fron the rear face. Cadmium sulphide (or CdS) cells come in different shapes and sizes but, electrically, they are essentially alike.

The external leads connect to either edge of a small wafer making up one face of the cell, and on which is deposited the photosensitive layer. When little or no light is falling on the wafer, the resistance between the two connecting leads is very high, being typically 1 megohm or more. With increasing amounts of incident light, the resistance falls progressively to a much lower figure — typically 100 ohms or less.

In the accompanying circuit, the photocell is shown connected in series with a 100k potentiometer across 6V DC, as would normally be obtained from four series-connected dry cells.

With no light falling on the cell, its resistance would be high and the voltage at the junction of the cell and potentiometer would be quite close to 6V. However, with increasing light, the voltage would fall towards 0V, depending on the setting of the potentiometer. This voltage, varying with incident light, is applied through a 4.7k resistor to the gate (G) or control electrode of a silicon controlled rectifier, shown as SCR.

"What," you may well ask, "is a

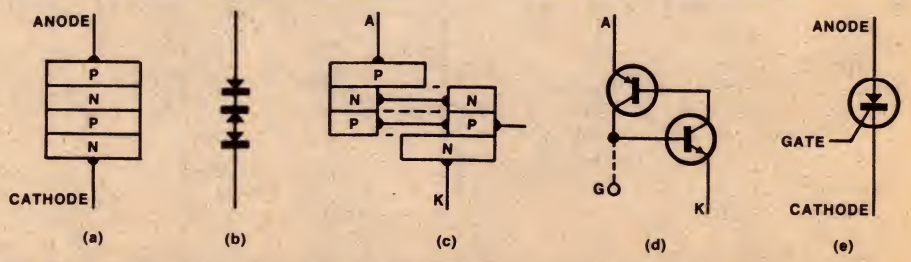


Fig. 1: Apart from anything else, this project provides a practical lesson in SCRs or silicon controlled rectifiers. A four-layer semiconductor (a) equivalent to three back-to-back diodes (b) would seem to be a particularly futile device. But it emerges in a quite different light, if seen as two intimately coupled transistors (c) and (d). The normal schematic symbol for an SCR is at (e).

silicon controlled rectifier?".

To answer this question anything like adequately would involve plunging more deeply into device theory than can be justified here and the reader who wants to really follow it up could do so in the Electronics Australia Handbook "Fundamentals of Solid State" by Jamieson Rowe. However, let's try for a somewhat simplified explanation:

Basically, a silicon control rectifier (or "SCR" or "thyristor") involves four distinct layers of silicon, doped respectively P,N,P,N, as illustrated in Fig. 1. Obviously, three P-N junctions are involved, with the centre one in opposite polarity to the other two. In fact, Fig. 1a could be likened to 1b, which provides the same sequence of P-N junctions, but in three separate silicon diodes.

The arrowhead portion of the diode symbols in Fig. 1b indicate the direction (and the only direction) in which each diode can conduct current, using the traditional concept of current flow from positive to negative. It would seem that, with one diode connected back-to-front, the configuration in 1b would not conduct current in either direction — unless, of course, the applied voltage was sufficicent to cause diode breakdown.

This must lead to the inference that Fig. 1b would be a futile combination of components. But, to contrive a multi-layer device such as Fig. 1a would seem to be even more futile: an elaborate way of producing a virtual open circuit, or a switch in the open position!

That last phrase, by the way, was not included for mere emphasis. In certain conditions, the multi-layer device in Fig. 1a can indeed simulate a switch in the "off" position.

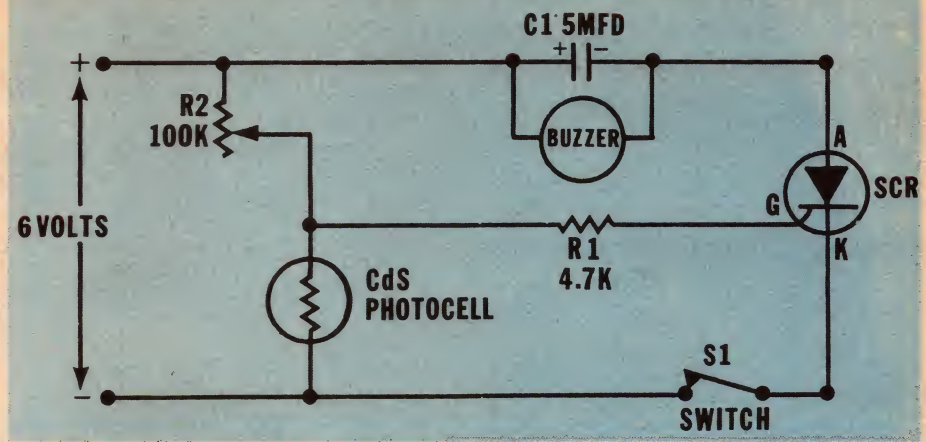
It transpires, however, that the multi-layer device (1a) can be regarded in another way: as two transistors in a paeudo series configuration, but sharing a common N layer and a common P layer, as illustrated in Fig. 1c.

If simulated by separate transistors, the circuit would look like Fig. 1d. If you examine the configuration closely, you will note that the output (collector) or each transistor is connected to the input (base) of the other. As a result, any small current in one is amplified by the other and fed back in such a way as to increase the effect; in short, a positive feedback loop.

Behind this observation lies the secret of the silicon controlled rectifier: by providing a separate connection to an internal junction region, it is possible to promote a small current flow in each of the two virtual transistors. By virtue of their cross-connection, each amplifies the small output current of the other, so that both are driven rapidly to saturation — therefore to high current conduction.

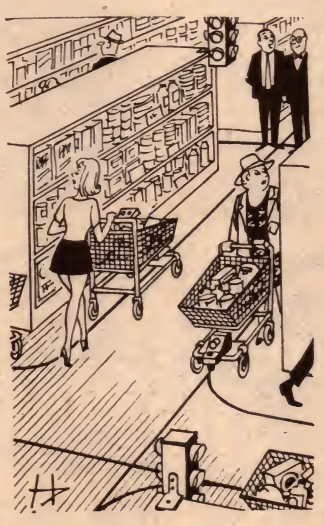
As a result, a silicon controlled rectifier has two states:

FIG. 2 SCHEMATIC DIAGRAM - LIGHT OPERATED ALARM



Here is the circuit diagram, reproduced directly from the "Science Fair" brochure. In the normal condition, light falls on the photocell, causing it to exhibit low resistance and holding the SCR gate close to the negative potential. When the light beam is interrupted, the resistance of the cell rises, the SCR gate approaches the +6V supply and the SCR switches on, thereby causing the buzzer to sound.

1. With no current fed to the internal junction (the "gate" or "G") the device looks like an open circuit, being analogous to back-to-back silicon diodes (Fig. 1b) or to silicon transistors with no forward bias, therefore no collector current and no means of driving each other to current saturation. It can maintain this "off" state indefinitely, if not deliberately "triggered" into conduction.
2. If a forward bias is applied to the gate and gradually increased, relative to the anode voltage, a point will be reached where the virtual transistors begin to conduct. The moment this happens, they drive one another almost instantaneously into saturation, so that the silicon controlled rectifier conducts heavily. Once "turned on" it will remain in the conductive state indefinitely, irrespective of gate voltage, for as long as the anode voltage is maintained.



"The kit has paid for itself a hundred times over. When they stop for the red light, they invariably pick up a couple more items!" (Adapted from Electronics Weekly.)

Because an SCR has these two distinct states, and operates like a switch that is either open or closed, it can often be used to control directly an alarm, a light or other device which is compatible with its voltage and current ratings. The need for a separate relay is thereby reduced.

After that spell of SCR theory, we can look again at the main circuit diagram:

An SCR is wired in series with a buzzer and an off-on switch across a 6V battery supply. If that was all there was to it, the SCR would look like an open circuit and nothing would ever happen.

However, the gate is wired to the junction of our photocell and a potentiometer, as mentioned at the beginning of the article. With light shining on the cell, its resistance is low and this tends to keep the gate close to the negative side of the supply, and the SCR non-conducting.

If the potentiometer resistance is now gradually reduced, a point will be reached where the SCR is turned on and the buzzer will sound. Backed off just slightly from this point, the SCR will be held in the non-conducting state by the resistance of the CdS cell, and therefore by the amount of light falling on it.

But let the light beam be interrupted and the buzzer will sound.

Quick! A customer has just come through the door!

At this point the alert reader may come up with an objection: If an SCR, once turned on, stays that way, will not the buzzer continue to sound, even after the light beam is restored?

A good question, but there's an equally good answer:

By its very nature, a buzzer becomes an open circuit on every cycle, so that when operating it is continually making and breaking the supply to the SCR anode. Thus the SCR really drops out of conduction on every cycle, allowing

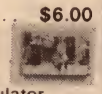
(Continued overleaf)

L.E. CHAPMAN

122 PITT RD, NTH CURL CURL
MAIL ORDERS BOX 156, DEE WHY, NSW 2099
TEL.: 93 1848

TV Tuner Valve Type $2.50
Including valves

TV Colour Frame Control Unit, complete board ... $6.00
Inc. ICS



TV Colour Frame Demodulator Unit, complete board ... $5.00
Inc. ICS

6 POS Push Button Switch $1.00

50/OHM Pots, ideal for ext. speakers, etc. 50c
Spark Gaps for colour TV AG 20M 202 500V 50c
Trimpots for printed boards 45c
In Line Bayonet Plugs and Sockets 20c
RCA Plugs and Sockets ..... Pair 40c
Power Leads and Sockets for Tape Records, Amplifiers, etc Pair $1
Speaker special 8 inch dual cone, 10 watts RMS 50 to 1600HZ $9 each. Pack & Post $1.50 pair. Interstate $2.50, WA $3.
Speaker miniature transformers drive & output ..... Pair $1
Slide Switches 3 Pos 75c
Toggle Switches 50c

RESISTORS

1000	OHM	5 watt	20c
150	OHM	5 watt	20c
6000	OHM	10 watt	25c
220	OHM	5 watt	20c
10	OHM	5 watt	15c
3300	OHM	10 watt	25c
5	OHM	5 watt	10c
500	OHM	10 watt	25c
6.8K	OHM	3 watt	15c
1K	OHM	5 watt	20c
220	OHM	10 watt	25c
8	OHM	10 watt	25c
4000	OHM	10 watt	25c
33	OHM	3 watt	15c
2.5K	OHM	3 watt	15c
150	OHM	5 watt	15c
27	OHM	5 watt	20c
10	OHM	5 watt	20c
47	OHM	5 watt	20c
12	OHM	3 watt	20c
812	meg	3000 volts	25c

SPECIAL!
100 MIXED NEW RESISTORS, ALL USEFUL. $2

THERMISTOR-STUD TYPE, 15Ω; 50c ea.

SLIDE POTS

25KA Dual 4 for $1;
50KC Single 4 for $2;
250KA Dual 4 for $1;
500KB Dual 4 for $1;
1MA Dual 4 for $1;

5K Vert TRIM POT 15c.
500Ω WW POT 50c.
10K TRANSISTOR POTS 4 for $1;

TUNING CAPS

2 & 3 GANGS CAPS $1.ea
2 GANG TRANSISTOR. 50c

FUSES 10 for $1

0·5A, 2A, 3·25A.
IN LINE FUSE HOLDERS 30c.
POWER LEADS for CASSETTE & TAPE RECORDERS $1 ea.
RCA JACK PLUGS 25c.
SMALL CHROME HINGES 40c Pr

DIODES

HR15	30c;	1N295B	10c;
1S309	10c;	OA630	30c;
OA636	1000V 2A	50c;	
EM404	400V 1A	10c;	
BA244	VHF SW	25c;	

TRANSISTORS

2SA15	20c;		
2SA101	20c;		
2SA234	20c;	BC548B	10c;
2SA351	20c;	BD139	50c;
2SB75	20c;	BD238	95c;
2SB186	20c;	OC9304	40c;
2SB303	40c;	OC9524	40c;
2SB337	60c;	OC9554	40c;
2SB370	40c;	2N1110	30c;
2SB405	25c;		

AD161/AD162 $2·50 PAIR;
OC955/OC957 $1 A PAIR;
OC967/OC968 $1 A PAIR;

SPECIAL
25 MIXED TRANSISTORS $2;

FANCY CHROME KNOBS FOR ¼in. SHAFT, PRESS FIT. FOR AMPS, etc 6 for $1.

MICRO SW
2A/250V AC 40c ea
5A/250V AC 60c ea

6 x D size BATTERIES HOLDER $1 ea.

SPEAKER PLUGS 4 PINS 10c
" SOCKETS 4 PINS 10c

PILOT LIGHTS Screw in
6·3 V 10 for $1·50
12 V 10 for $1
24 V 10 for $1

AUDIO LEADS
3·5 mm to 3·5 mm 7ft. 75c
3·5 mm to 6·5 mm 7ft. 75c
6·5 mm 7ft long, 50c

AERIAL & OSC COILS FOR VALVE RADIOS. 75c ea

455K IF TRANS. $1

1500V CAPS 5 for $1
0·0039uF, 0·0068uF, 0·011uF,

GARRARD 11 in. TURNTABLE with Cueing & Cartridge. Slightly shop soiled.
ONLY $14.

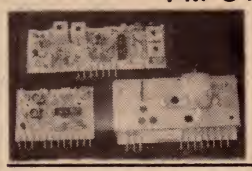
pack & post $2·50, INTERSTATE $3·50.

SPECIAL!
100 MIXED NEW CAPACITORS. ALL USEFUL. $2

POWER TRANSFORMERS
240V to 18V, ½ amp, $2.50

SUPER SPECIALS!

FM STEREO TUNER KITS

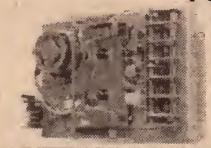


SETS OF 3 MODULES INCLUDE FM TUNER, DECODER & IF/DETECTOR. CIRCUIT DIAG. SUPPLIED; CAN BE USED WITH AMP MODULES.
ONLY $18!

POWER AMPLIFIER KITS

10W RMS per CH. WITH POWER TRANSFORMER & CIRCUIT DIAGRAM.
SUPPLY incl. +15V for TUNER or PREAMP.
ONLY $15!

VORTEX DECKS



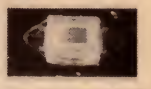
COMPLETE WITH HEADS & CIRCUIT FOR AMPLIFIERS FOR THE DECK.
ONLY $25!

SPARE ERASE HEADS for above $2 ea

VU & BALANCE METERS

STEREO VU $3

12Kn 100uA $2



BALANCE $1

ELECTROS

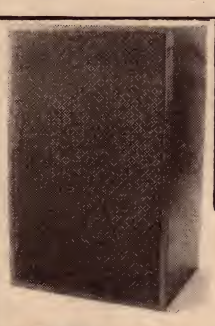
68	UF63V	10 for $1
470	25 volt	10 for $1
16	UF350V	50c each
47	UF63V	5 for $1
47	UF160	5 for $1
400	UF10V	10 for $1
68	UF15V	10 for $1
47	UF10V	10 for $1
10	UF10V	10 for $1
1000	UF10V	10 for $1
470	UF16V	5 for $1
25	UF63V	5 for $1

CAPS

0.0 68 PF	10 for $1
0.0 33 MFD 200V	10 for $1
.046 UF 600V	10 for $1
1200 PF 400V	10 for $1
56K 250V	10 for $1
0.047 UF 400V	10 for $1

ROTARY SWITCH 2 POS. 3 POLE, 50c

SPECIAL SPEAKERS, 2¼ inch, 2 for $1



SPEAKER CABINETS
10W RMS with 2 Dual cone SPEAKERS; size 16·5 x 10·25 x 8;
$16 ea.
P&P NSW $3 pair. INTERSTATE $5.

POWER TRANS.
240V/120V +
2 x 25V + 6·3V
$6 ea.

Size 10 x 7·25 x 4 with 6x4 spkr.
IDEAL AS EXT. SPEAKERS.
ONLY $4·50 ea.

TV Stick Rectifiers
TV 20 SC
$1.00

SPECIAL!
PORTABLE 4 SPEED RECORD PLAYER
$27.50

24V MOTORS
REVERSIBLE.
only $2 each

PHILIPS TV TUNER
Transistor
NT3032
Colour
$10 ea

FM SIGNALS, FM ANTENNAS

and all that jazz!

The prospect of additional FM/stereo broadcast stations has raised, for some, the question of a suitable antenna for their FM tuner. Rod or ribbon dipole? Should the tuner have a special outdoor antenna of its own, or can it share the signal from an existing TV antenna?

One of the factors which have tended to confuse the issue is that FM sound transmissions are often heard under quite adverse conditions or at distances much greater than would normally be expected. This can lead to the very dubious conclusion that an FM tuner or receiver can get by, for an antenna; with little more than the proverbial "piece of wet string"!

However, there can be a considerable gap between merely hearing an FM transmission and receiving it to best advantage, particularly when it is hoped to do so in stereo mode. Ideally, and for all practical purposes, it should be noise-free.

A disturbing anomaly that has occurred in Australia arises from the Broadcasting Control Board's early guideline that the polarity of FM transmissions should be the same, in each area, as that assigned to the TV stations. In many centres, including all the state capitals, this implies horizontal polarisation; yet it is in these very areas where there is a heavy concentration of AM/FM car radios and portables operating from vertical whip antennas

Having in mind the dissimilar polarisation and the fact that the whips are seldom adjusted to a resonant length, FM reception in these circumstances is already prejudiced. There have been complaints, particularly from the Melbourne area, of FM signals "fluttering" with the motion of the vehicle and of severe distortion in the case of stereo reception. This is not surprising, considering that the receiver is having to rely, for much of its signal, on random scatter of polarisation.

There is little that the listener in a car can do to alleviate these problems other than, perhaps, experiment with the antenna, to discover the length which seems optimum for the preferred station, and to switch to mono mode when stereo is unsatisfactory.

With a portable receiver having one or more whips for FM reception, it may be necessary to discover by experiment where it operates to best advantage and the best adjustment for the whip(s).

In this general connection, support is growing for the idea that all Australian FM broadcasting stations should use an antenna system which provides mixed or circular polarisation for the transmitted signal. This will ensure a deliberate rather than random feed to vertical whips on car radios and portables, while still leaving an ample horizontal component for properly in-

(Continued overleaf)

A Simple Intruder Alarm — continued

the gate to inhibit conduction — or to turn the SCR off — the moment the light beam is restored.

Why the capacitor across the buzzer? If for no other reason, it is wise to bypass any buzzer, relay or other such device in the anode circuit of an SCR, in order to suppress inductive voltage spikes which might exceed the SCR voltage ratings.

As you may have guessed from the picture at the head of this article, the project was inspired originally by an Archer kit, (No. 28-128) — sold in Australia through Tandy stores. At $7.95 for everything as pictured, excluding the batteries, it is probably the easiest way to acquire the necessary bits and pieces. It comes complete with a pamphlet describing the construction and setting up on a step-by-step basis, and anyone who can solder should be able to put it together.

However, if you do want to buy elsewhere, the potentiometer, switch and electrolytic capacitor are standard items. The CdS cell and SCR in the original kit are not branded but we imagine that almost any such cell and any small SCR that you are likely to come across will serve the purpose. Archer provide a small heat sink — about 1cm square — for their SCR and you could follow suit by snipping one from a scrap of tinplate. Allow enough extra metal so that you can clip it around the SCR body.

The buzzer may pose more of a problem, since a low voltage, low current type is required. The original is simply marked "3V" and shown as a "Science Fair" or "Archerkit" part number 99-5-007. We note, however, that Tandy list a low voltage buzzer in their catalog and this would probably serve the same purpose. (Part 273-004, $1.39).

The original kit drew 1.1mA from the 6V source when idling, and 225mA when the buzzer is sounding. Since the latter condition is highly intermittent, battery drain for the unit itself is no problem. For a permanent installation, a logical course would be to run it from four D-cells or a lantern battery, much as one does with door chimes.

The light source is another matter. For purposes of demonstration, the original pamphlet assumes the use of a torch or any other light source — even daylight — that allows the CdS cell to be shadowed. For longer term use, such as a door minding situation, it would be almost essential to resort to mains operation, preferably a low voltage lamp run via a transformer, and to contrive some kind of beam.

In fact, while the circuitry can remain exactly as shown, the physical form of the unit can be a challenge for the builder's ingenuity.

Our suggestion would be to build the alarm unit into a small box which can be mounted unobtrusively in a position where the beam will be broken by a person crossing the threshold. Paint it a dark, flat colour, so that it will not be readily illuminated by stray light.

The cell itself should be mounted deep inside the box and preferably at the rear of a tube painted flat black internally. This arrangement tends to reduce illumination from ordinary ambient light, while still leaving the cell accessible to a deliberately arranged beam. With a little more ingenuity, the tube can be made somewhat larger than the cell, and a small magnifying glass so placed inside it that it will focus the beam onto the surface of the cell.

For the light source, it may be possible to use the front section of a small but well-focussed torch, but to operate the globe from a suitable mains transformer. This, too, could be set back in a tube, painted in flat black, to confine stray light. Again, a small magnifying glass, critically placed in the tube, may sharpen the focus of the beam.

Last but not least, a piece of red filter glass or even red perspex across the light source and the cell tube can render the beam less visible, without compromising its effectiveness. (For further observations along this line, see the "Simple Projects" chapter in our "Basic Electronics" handbook).

As we said earlier, this can all be a test for your ingenuity, for not too many dollars or outlay. Have fun!

stalled rooftop antennas.

Of special note is the fact that Sydney's newest stereo broadcaster (2CBA-FM, 103.2MHz) has opted for circular polarisation. This follows lengthy discussion with the Broadcasting Tribunal and the P&T Department and the installation is likely to serve both as a test case and a trend setter.

For a domestic hifi installation, some kind of provision has to be made to receive FM signals, if only because FM tuners rarely have antennas attached. An internal signal feed from the mains, or a random length of wire clipped to an antenna lug are altogether too makeshift for most situations.

Widely accepted as a minimum provision is a dipole made up from 300-ohm antenna ribbon, as shown.

Assuming that the wanted stations operate with horizontal (or circular) polarisation, the antenna should be positioned horizontally and broadside — on to the general location of the transmitters. Within the listening room, it can be pinned to a wall or shelf or cupboard, but not adjacent to metal surfaces.

While possibly adequate in strong signal areas, an antenna within a room can be affected by the movement of people, or metal furniture or metal blinds.

If suspended from the rafters above the ceiling, such problems are minimised but signal pickup can still be compromised if there is a layer of foil under the tiles, or if the roofing material itself is metallic.

For most householders, the best compromise is probably to provide one good quality TV antenna and to divide its output between the TV set and the FM tuner. While capital city TV antennas (ch. 0,2,7,9,10) are not optimised for the FM band, their signal pickup from the FM transmitters will be ample in most suburban locations.

Since most householders will already have a reasonable TV antenna — a heritage from the colour revolution — it simply becomes a matter of arranging a junction point and an extra run of cable; it's a job that should not exceed the capabilitlies of the average handyman.

Antenna cable can be bought from electronic parts suppliers — Dick Smith, Tandy, etc — and should logically be similar to what is already installed between the antenna and the TV set: either 300-ohm twin ribbon, or 75-ohm coaxial cable. FM tuners commonly have provision for both.

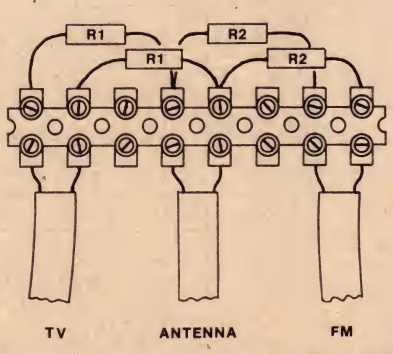
Whichever is used, however, it should not simply be joined in parallel with the existing cable as, for example, by continuing the run onwards from the terminals of the TV set. At the frequencies involved, lengths of cable tend to exhibit obvious reactive properties, so that the mere presence of a branching cable can play havoc with the signal level elsewhere. For these reasons, it is essential to provide proper "pads" or "splitters" at the junction point, to isolate runs of cable, one from the other.

TV aerial splitters can be bought from electronic parts supply stores, for either 300-ohm or 75-ohm down leads, for indoor or outdoor mounting, and for a 2-way or 4-way split. All splitters introduce some signal loss by their very nature and, for this reason, a 4-way splitter should not be considered unless the antenna is a high gain type, so placed as to intercept a generous level of signal.

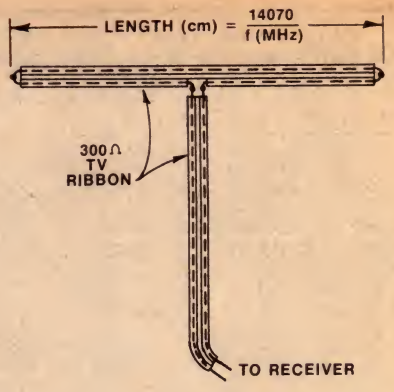
For those who prefer to make their own, a 2-way 300-ohm splitter can be put together as per Fig. 2.If installed in the ceiling area, it can be left bare, as shown. Elsewhere, it may have to be protected from the weather or hidden from view.

The resistors can be quarter — or half — watt types and normal practice would be to make them all 150 ohms. If one considers that the receivers themselves each represent an impedance of 300 ohms, each branch would aggregate a resistance of 150 + 300 + 150, or 600 ohms. The two branches in parallel would thus represent 300 ohms, thereby correctly terminating the incoming cable from the antenna.

The splitter can quite easily be modified slightly to give the TV receiver a greater share of the signal possibly warranted because "noise" tends to show up so readily in a high definition colout picture. Thus the R1 resistors serving the TV set can be dropped to 120 ohms and the R2 pair increased to 180 ohms. The input inpedance to the combination stays close to 300 ohms,



Shown above is a simple way of making a 2-way splitter for a 300-ohm TV antenna down-lead. The arrangement of the isolating resistors varies from this in some of the commercial splitters but, presumably, they would do the same job.



For use indoors, this dipole can be made up from a length of ordinary 300-ohm antenna twin-head, either black or opaque. The joints could be twisted but soldering provides a more reliable connection.

thus terminating the main feedline. Each of the branches would be terminated by the respective receivers and one must assume that they are what they purport to be: 300 ohm inputs.

Other combinations of resistors can be used, provided the net load on the main down lead is maintained at 300 ohms. Yet again, a 3-way splitter can be made up, but using three sets of isolation resistors, all around 300 ohms.

Splitters for coaxial feed cables tend to be somewhat more difficult to construct — and more costly to buy — because of the hardware involved: coaxial sockets for the input and outputs, and coaxial plugs to fit to the ends of the cables. Even so, the cost of a coaxial splitter ($6 to $7) is a lot less than a separate outdoor antenna installation.

However, there are locations where even half the signal from a TV antenna is going to be insufficient to guarantee a consistent noise-free stereo signal. In such a case, even the total signal from a TV type antenna may be suspect if for no other reason that a TV antenna (at least a capital city design) may be a dubious performer over the FM band.

Where the are problems of this order — usually in areas shadowed by intervening hills, the appropriate course is to buy and install a multi — element antenna especially designed to cover the FM band. As with TVantennas, the greater the number of elements, the higher will be the price; but there is reason to hope that the gain will be improved also.

FM antennas are advertised by various organisations but one series that should be especially worthy of consideration is that designed in Australia by the well known authority on antennas and propagation, Dr. R.J.F. Guertler. Without knowing all the distribution arrangements, details and prices can be obtained through Audiosound Electronic Services, of 148 Pitt Rd, Nth Curl Curl, NSW 2099.

BRASS SHIPS CLOCKS SMITHS 8 DAY 7 INCH DIAMETER $110

Post A **$1.75**; B **$3.00**; C **$3.60**.

GENUINE EX ARMY WRIST WATCHES

Complete with nylon band **$19.50**
Post $1.10

P.M.G. TYPE TELEPHONES

Standard desk type with magneto bell calling device. Range 30 miles. Uses standard batteries at each phone. Any number can be connected together on single line. **$39.50**
(2 TELEPHONE SETS)

$2 Cartage to Rail. Freight payable at nearest attended Railway Station.

RECEIVER No. 210

2-16 M/cs **$65.**
Transmitter No. 11 suits 210 **$35.**
24 volt Power supply to suit above **$15.**
Or complete station with Headphones, Mic. Morse Key. **$110.**

EX ABC MAGNETIC RECORDING TAPES ¼"

PROFESSIONAL QUALITY
5" x 600' **$1.50**
7" x 1200' **$2.75**
P + P $1.30
10½" x 2400' $7.95
P + P A.$1.65 B.$2.75 C.$3.10

COLLINS INDEPENDENT SIDEBAND TRANSCEIVER TRC/75

Fully synthesised transceiver with am, upper, lower and independent sideband operation, 1KHz steps from 2MHz to 29.999MHz 1 microvolt sensitivity, 2.5KHz bandwidth ssb, 6KHz bandwidth AM 1 RW. PEP max output. Fully automatic tuning of both transmitter and receiver from remote control unit. Complete with automatic aerial coupling unit, mic, headset, etc, 400Hz supply.
Ideal for amateur use.
PRICE $750

COLLINS SYNTHESISED 1 SB RECEIVER

TRC/75 receiver section of transceiver specification as above.
PRICE $400

TELEPHONE WIRE

1 mile twin (2 miles) genuine ex-Army Don, 8 perfection condition $35 per drum, $2.00 cartage to rail freight payable at destination.

RCA 44BX MICROPHONES

PROFESSIONAL QUALITY $75
P&P A. $1.80, B. $3.50, C. $4.55, D. $4.55.

20X to 60X ZOOM TELESCOPE

With Tripod, **$115.50.**
Post **A$2.25, B$4.10, C$6.10.**

AERIAL CAMERAS

WITH 8" FL 3" DIAM. LENS F24 MARK IV 2.9 LENS STOPS 11, 8, 5.6, 4, 2.9 — $2 CARTAGE TO RAIL FREIGHT PAYABLE TO NEAREST ATTENDED RAILWAY STATION

PENTAC LENSES

3" DIAM. 8" FL WITH DIAPHRAGM STOPS 11, 8, 5.6, 4, 2.9. MOUNTED IN METAL HOUSING — **$65**
POST: A. $1.85, B. $3.25, C. $4.10

PRISMS

4" SQUARE FACED RIGHT ANGLE PRISMS TOP QUALITY EX AIR FORCE — **$65**; OR LENS & PRISM FOR **$120.**
POST: A. $1.75, B. $3.00, C. $3.60

SOLENOIDS

200 MA 24 volt, ⅛in push movement, **$2.50** P+P 80c

NIFE CELLS

1.2 volt, fully charged, 4in x 3in x 1in 4 AH.
$1.50 each. P&P 80c.

CENTRE DRILLS 15"/64 x 5/64
Carbon Steel, **$3 dozen**
Post 60c

ARTILLERY DIAL SIGHTS MK2

Can also be adapted as a Dumpy Level or as base for a telescope has full 360? 5½" diam. gunmetal rotating circle. Adjustable elevation and depression. Has top grade ¾" diam. object lens. F.L. 10" with cross hairs, eyepiece, ½" right angle prism — height 10" — weight 3½kgs. With leather carrying case. Original cost $300.
Our Special only **$27.50**
P&P A.$2.25 B.$4.00 C.$6.00

POSTAGE KEY:

A: NSW
B: Vic, Qld, SA
C: NT, Tas.
D: WA

VALVES

BRAND NEW

6SN7	**$1.95**	6BN8	**$1.95**
5U4	**$1.95**	6GV8	**$1.95**
EF50	**$1.50**	6AK5	**$1.95**
5Y3	**$2.95**	1H6	**$1.50**
2x2	**$1.50**	832	**$5.00**

P+P 80c

6x4	**$1.95**
VR65	**$1.50**

STC HIGH IMPEDANCE HEADPHONES

3400 ohms, brand new, only $4.95 pair.
P&P, A $1.65, B $2.75, C $3.10.

ZOOM SPOTTING SCOPES

30 x 30
LENGTH 12½", HEIGHT 10"
WEIGHT 1¾ lb
$32.50

45 x 40
Length: 16in
Height: 10in
Weight: 2lb
$49.50

High grade coated lenses. Ideal for pistol and rifle ranges or general viewing. Zooms in from very low to high powers. Complete with tripods.
POST: A. $1.75, B. $3.00, C. $3.60

TELESCOPES
25 x 30 $13.50
P&P A. $1.30

SPY TELESCOPES

8 x 17 mag size of a rifle cartridge extends to 8". Only **$7.95** each, post 60c.

BINOCULARS

PRISMATIC Coated Lenses. Brand new Complete with case.

8 x 30	**$36.50**		
7 x 50	**$48.95**	P&P	
10 x 50	**51.00**	A	**$1.75**
12 x 50	**53.00**	B	**$3.00**
		C	**$3.10**

SMALL CLIP-ON POCKET TELESCOPE

15X **$7.00, P+P 80c**

3" ASTRONOMICAL REFLECTOR TELESCOPE

117X magnification FL 700mm with 5x24mm finder scope and two section hardwood tripod. **$169.25.**
Post **A$2.25, B$4.10, C$6.10.**

3000 TYPE RELAYS

P.M.G. 200 ohms — 1,500 ohm Coils **$2.50** each P+P 80c

AIRCRAFT INSTRUMENTS

Directional Gyros.
AN5735-1 Air Operated
$35
Sperry Artificial Horizon.
AN5736-1 Air Operated.
$45.
Slip and Turn Indicators
$17.50.
P&P
A. $1.65, B. $2.75, C. $3.10

SIEMENS Typing Perforator

240 Volt Type with Keyboard **$57.50**

ROLA 66 MK 2 TAPE RECORDERS

Good condition **$275.00**

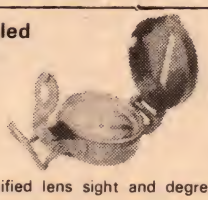
CONDENSER LENS

1½" diam. 4½" F.L. **75c.** 2½" diam 2" F.L. **$1.50** each or **$2.50** per pair. P&P 80c

IMPELLER PUMPS

New gunmetal body, Stainless Steel Shaft, Neoprene Impeller. Up to 15ft. Lift, suitable for almost any type of liquid. Self priming. Ideal boat bilge pump, sullage drains, etc. Approx. size 8" x 5"
⅜" **$30.35**, ½" **$43.30**, ¾" **$47.60**
P+P: A. $1.95, B. $3.50, C. $4.60

Liquid filled compass



With magnified lens sight and degree reader.
Only **$7.95** each. Post $1.30

POLARITY & CURRENT CHECKER

3 volt to 400 volt. Simple leads and prods quickly determines positive or negative with illuminated indicators, also checks AC current and intensity, fully insulated only **$4.95**, pp $1.30.

MAGNESIUM DRY CELL BATTERIES

Suits PRC 25 and dozens of other uses. 15 volts long life only **$1.50 ea.**
P+P: A. $1.35, B. $2.75, C. $3.60

WRIST WATCHES SWISS JAEGER

Le Coultre ex RAAF rated one of the world's best in smart chrome case with black dial. Original cost $250.

SPECIAL **$49.50**
Post **$1.30**

THEODOLITES

Made by Wilds Microptic, with tripod Model T1, reads down to one minute of ARC **$750.**
(Usual Price **$1750**).
Model T2 reads down to one second of ARC **$1000** (Usual Price **$3200**).
Freight payable at nearest attended R'way Stn.

ZOOM FOCUSING MICROSCOPES

Zoom focusing microscopes, 750X battery and mirror illuminated $31.75.
Zoom 1200X similar to above $47.95.
P&P A $1.65, B $2.75, C$3.10.

TRANSCEIVERS Ex Army

No. C45 set. 23 to 38MHz with headphones, mic. 24V power supply, etc. **$95.00**

$1.00 cartage to rail, freight payable at nearest railway station.

EX-ARMY TWO-WAY FM RADIOS

1.2 WATTS OUTPUT
SUPERHET
PRC9 AND 9A 27 to 39M/HZ
PRC10 AND 10A 38 to 55M/HZ
WITH HANDSET ANTENNA $25 EA.
UNTESTED
Battery $3.95 extra. Harnes $4.50 extra
$2 Cartage to Rail. Freight payable nearest attended Railway Station.

16MM SOUND PROJECTORS IN GOOD WORKING ORDER

240 volts operated complete with Speaker and Amplifier.
RCA **$275**
BELL & HOWELL **$195.**
$1 Cartage to Rail. Freight payable at nearest attended Railway Station.

SELSYN MOTORS MAGSLIP

RECEIVERS 2" MK2 $5.50
TRANSMITTER 3" MK2 $15.00

Post Packing A. $1.75, B. $2.75, C. $2.75, D. $3.65.
P+P: A. $1.75, B. $3.00, C. $3.10

COMMUNICATIONS RECEIVER

COLLINS R — 391/URR

Continuous tuning of range 500 Kills — 32MHz in 32 bands. Receive frequency indicated directly on digital counter type readout to within 300Hz. Selectivity adjustable in six steps. From 100Hz to 16KHz bandwidth. Sensitivity 1 microvolt or better 240 VAC operation — 10 inch rack mount — autotone on eight preset channels available complete with instructions and service manual and tested.
PRICE $500.

Deitch Bros.

70 OXFORD STREET, SYDNEY 2010

SORRY NO C O D

Faster dumping & loading for the 2650

Here are some utility routines which will enable your 2650 system to dump programs, verify and reload them — all at 300 baud and using a binary format. This gives dumping, loading and verifying times roughly one sixth of those using PIPBUG's 110 baud hex format. The routines are intended for storage in a 2708 EPROM along with the utility routines described in March 1979.

by DAVID EDWARDS

Once your 2650 system is up and running, one of the first things you discover is that a lot of your time can be spent waiting while programs are dumped to or read from cassette tape. So naturally, any means of speeding up this process is most welcome.

We have presented 300 baud routines in the past, but these have mainly been intended for use with a PIPBUG format bootstrap leader, rather than to be stored in ROM. They also provided an "autostart" facility, where a program could be arranged to begin executing automatically as soon as it was loaded.

The present author feels that in a small cassette-based system, such as the majority of 2650-based systems currently in use, an autostart facility is not a great deal of use. This is because many small systems have no easy means of automatically stopping the tape transport once a load has been completed. The tape transport must really be stopped by hand, before the loaded program is started.

For this reason I have chosen to write new routines from scratch, specifically to be stored in an EPROM. This made it possible to use some of the routines already existing in the ROM (see March 1979), and thus minimise the amount of code to be stored; it also ensured that the routines would be ROM compatible.

In fact, the finished routines require only 251 bytes storage, which still leaves a total of 327 bytes unused in the 1k 2708 EPROM. 6 bytes of RAM are required as a scratch pad, at locations X'2FFA to X'2FFF, but this is the same RAM as used by the earlier routines.

The recording format used by the new routines is shown in the diagram. As the routines were intended only for use with cassette tapes, the leader and trailer consist of 10 second periods of continuous mark. Only a single block is used for each dump, and it is nearly impossible to separate blocks in a cassette recording (unlike paper tape). In addition, gaps between blocks take up additional time during both dumping and loading.

No provision for autostarting is made. At the end of a load, control is passed back to PIPBUG. A colon (:) is used as the prompt to signify the start of the block.

Two block checking code (BCC) bytes are included. The first one is used to ensure that the start and end addresses are read in correctly from the tape. The second BCC checks for a faulty data byte.

The format used differs from that used by PIPBUG, in that both start and end addresses are specified initially on the recording for the memory area to be dumped. This change was made solely because it suited the existing ROM routines.

The routines are intended to occupy locations X'3DBE to 3EB8, as shown in the listing. However I suggest that you use the hex input routine to load them initially into another area in your RAM (say X'1DBE—1EB8). The PROM programming program given in the February 1979 issue can then be used to store them into the EPROM at the correct addresses.

The first section of the listing, from locations X'3DBE to X'3E01 inclusive are the actual 300 baud input and output routines, called 3IN and 3OUT. These are completely self contained, and are fully relocatable without modifications, as all relative addressing is used. They are written as subroutines, and are equivalent to CIN and COUT of PIPBUG. The calling address for 3OUT is X'3DBE, while that for 3IN is X'3DE4.

3OUT and 3IN can be used to communicate with your terminal at 300 baud. The bit rate is set by the LODI instructions at locations X'3DDB and X'3DDF, and assumes a 1MHz clock rate.

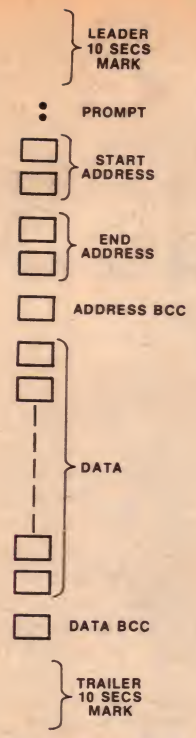
The remainder of the space is occupied by the DUMP, LOAD and VERIFY routines. To dump a program, type G3E02 AAAA BBBB cr, where A is the start address of the memory area to be dumped and B is the end address. The dump will include locations A and B. A ten second blank leader is provided at the start of the dump, with a similar sized trailer. A 4k dump will take just under three minutes.

To verify a tape, rewind it, type G3EA2 cr, and then start the tape. The contents of the tape must still be stored in memory of course, as the verification consists of comparing the data from the tape with the corresponding data still in memory. The program will respond with "OK" if the tape is correct, or "FAULTY" if a BCC or data error is detected.

To load a tape, type G3E53 cr, and

```
3DBE 77 1C
3DC0 C2 05 03 74 40 3B 14 52 1A 04 74 40 1B 02 76 40
3DD0 F9 73 3B 27 76 40 3B 03 75 10 17 04 B5 F8 7E 04
3DE0 B5 F8 7E 17 77 10 05 00 06 03 12 1A 77 3B 7C 12
3DF0 1A 72 3B 67 12 44 30 51 61 C1 FA 76 3B 5D 01 75
3E00 10 17 3F 3C 07 3F 3E 43 20 CC 9C FE 04 3A 3B 93
3E10 0D 0F FA 3B 2C 0D 0F FB 3B 27 0D 0F FC 3B 22 0D
3E20 0F FD 3B 1D 0C 9C FE 3F 3D BE 20 CC 9C FE 0D 3F
3E30 FA 3B 05 3F 3C 2A 1A 76 0C 9C FE 3B EB 3B 09 9B
3E40 22 3F 02 3D 01 3B E1 17 20 01 06 11 F8 7E F9 7C
3E50 FA 7A 17 3B 26 9C 3D 0E 3B 1C 3B 13 CD 8F FA 3F
3E60 3C 2A 1A 76 3B 9A EC 9C FE 1C 3C F8 1F 3D 0E 3B
3E70 8F C1 3F 02 3D 17 20 CC 9C FE 17 76 40 77 02 3F
3E80 3D E4 E4 3A 93 79 3B 6E 3B 65 CD 0F FA 3B 60 CD
3E90 0F FB 3B 5B CD 0F FC 3B 56 CD 0F FD 3B E2 EC 9C
3EA0 FE 17 3B 57 9C 3D 0E 3B 4D 3B 44 FD 3F FA 9C 3D
3EB0 0E 3F 3C 2A 1A 73 1F 3F 64
```

Here is a full hex listing of the two 300 baud routines.



CONDENSED 300 BAUD
BINARY FORMAT

This is the recording format used. All numbers are in binary.

then start the tape. If a BBC error is detected in the addresses read from the tape, the message "FAULTY" will be produced, and the load will stop. Assuming the correct addresses are read from the tape, the load will proceed.

Once the data file has been read in, the data BCC is checked. If the BCC from the tape agrees with the calculated BCC, the message "OK" is printed. A mismatch will produce the message "FAULTY".

I have found the routines to be quite reliable, and have made quite a few 4k memory dumps with complete success. The reduced loading time is very convenient, allowing quite large programs to be reloaded very quickly.

The routines use the PIPBUG routine CBCC, and the existing ROM routines GPAR, FAULTY, OK and INCRT. Only 4 instructions require changes to relocate the program; these are located at addresses X'3E05, 3E27, 3E7F and 3EB6. Other absolute instructions in the programs point to locations in PIPBUG, the RAM buffer area, and the existing ROM.

To burn the programs into your 2708 EPROM, load them into a convenient area of RAM, as well as the PROM program. It is not necessary to reprogram the complete PROM: simply program in the new routines at the correct locations.

Note that in order to allow the routines to operate correctly, it is necessary to disable the monostables on the PROM board when in the read mode, as detailed in the Notes and Errata section of the March 1979 issue.

"HOW TO TURN ELECTRONIC THEORY INTO PRACTICE AND MAKE IT PAY"...

"If you understand and enjoy radio and electronics and want to extend your knowledge and experience, then we at Stott's can help you.

Stott's have home-study courses for complete beginners in Radio theory and basic Electronics through to the standards needed to maintain and service Colour Television.

Anyone who has these skills at their fingertips can make it pay by turning a fascinating hobby into a lucrative part or full time profession."

Athol H. Kelly B. Com. (Hons.) A.A.S.A., F.C.I.S.
Principal, Stott's Technical Correspondence College

Stotts
TECHNICAL CORRESPONDENCE COLLEGE
The name to trust in correspondence education.

Melbourne, 159 Flinders Lane, 3000. Tel: 63 6212
Sydney, 383 George Street, 2000. Tel: 29 2445
Brisbane, 290 Adelaide Street, 4000. Tel: 31 1627
Kent Town, 66 King William Street, S.A. 5067. Tel: 42 5798
Perth, 89 St. Georges Terrace, 6000. Tel: 322 5481
Hobart, 1st Fl. 29 Argyle Street, 7000. Tel: 34 2399
Singapore, P.O. Box 3396, Singapore 1.

Please send me free, and without obligation, full details of the following courses:

_____ (PLEASE PRINT)

_____

MR. MRS. MISS _____ AGE _____

ADDRESS _____

_____ POSTCODE _____

Stott's undertake that no sales counsellor will visit you.

The Stott's range of courses in Electronics are:

Radio for Amateurs
Introduction to Electronics
Digital Electronics
AM Radio Receivers
Radio/TV Servicing
Colour Television
Amateur Radio Operators' Certificate

A full range of Hobby and Business courses also available.

ALA/ST547/EA479

Low cost printout for your Mini Scamp

Here is a simple way of providing our Mini Scamp microcomputer with a low cost printer, by interfacing it to a surplus Baudot teleprinter machine. Complex software driver routines are avoided by using a UART device to do the parallel-to-serial conversion

by IAN DAVIES

100 Abbott Street, Sandringham, Victoria

Mini Scamp is a great starting point to learn the basics of microprocessors operation, but the budding computer enthusiast soon becomes sick and tired of communicating with it in binary, specially when friends refer to it as "that little box that just sits there flashing its lights".

The next step for the home computer owner is to think about investing in some form of VDU. However two factors rapidly become evident. The first is that a simple VDU will cost at least $200, and the second is that in its original form Mini Scamp is unable to talk to the terminal since it has no serial input or output, just eight parallel bits. One solution is to buy the National Semiconductor KITBUG ROM, which contains subroutines that allow the sense-B and flag-0 pins to be interfaced to an ASCII terminal. This is not only costly but also commits the owner to using the expensive ASCII equipment.

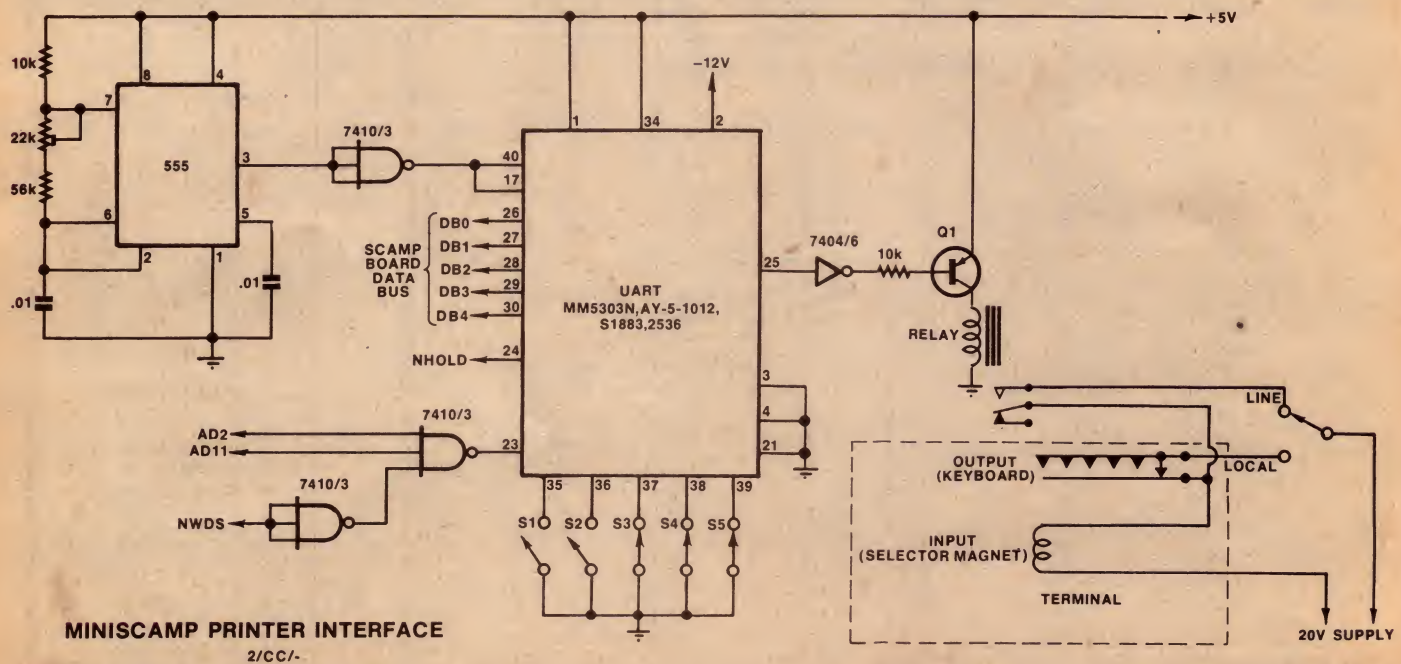
On the terminal side, a more attractive solution is to use one of the old teleprinter machines now available at most cost on the second-hand market. The only catch is that these machines communicate not in ASCII code, but in 5-bit Murray or "Baudot" code; so Mini Scamp must be able to communicate in this code if such a machine is to be used as a terminal.

Broadly speaking there are two ways of giving Mini Scamp the ability to communicate in Baudot code: the software way and the hardware way. The software way requires simple interfacing hardware, like that used for ASCII interfacing with the KITBUG ROM, but on the other hand you need to write suitable timing and coding routines and store these in Mini Scamp's memory.

To be sure, such routines can be written fairly easily. But toggling them into Mini Scamp's memory each time it is used would be a pretty daunting prospect even for the most seasoned switch-flicker. Not only that but the routines tend to gobble up precious space in Mini Scamp's modest memory.

The only alternative to toggling the routines into RAM is to burn them into a PROM. This is quite feasible, but PROMs are not cheap, and you either have to pay money to have them programmed, or build up a programmer yourself. Not everyone wants to go to these lengths simply in order to use a terminal.

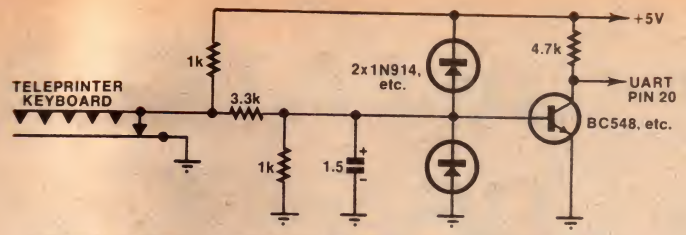
In contrast with the software approach, the hardware approach is very straightforward. The interfacing hardware is not much more complex than with the hardware approach, and still quite low in cost. And no lengthy software routines are required at all;



MINISCAMP PRINTER INTERFACE

2/CC/-

Here is the circuit for the author's low-cost interface, which allows Mini Scamp to talk to a surplus Baudot teleprinter. A UART device does all the work of parallel-serial conversion, which considerably simplifies the software required. Keyboard interfacing can also be provided, if you wish. Details are given in the text.



OPTIONAL INTERFACING BETWEEN TELEPRINTER KEYBOARD AND UART

You can use this interface to couple up the teleprinter keyboard to the UART also, if you wish. The text gives further details.

from a programming point of view the terminal simply becomes an address in the computer's memory space.

In short, I believe the hardware approach is the ideal way to interface a Baudot teleprinter to a simple computer like Mini Scamp. The cost is kept down, programming complexity is minimised and memory space is not sacrificed — all worthwhile advantages in view of the intended use of Mini Scamp a low-cost educational tool.

The circuit described here uses the hardware approach, and has been used successfully for some time to provide my own Mini Scamp with a printer facility using a surprlus Baudot teleprinter. The circuit's novelty lies in its simplicity, as its only fuction is to convert from parallel format to serial. It is based around that magical little IC, the UART (short for "universal asynchronous receiver/transmitter").

There are at least for standard UART devices available on the market at the moment, these being the MM5303N, S1883, AY-5-1012 and 2536. Any of these UARTs are suitable for use in this project as they are all much the same.

LOCATION	CONTENTS	COMMENTS
00	08	No operation
01	C408	Load AC with 08
03	35	Exchange with hi byte of pointer 1
04	C411	Load AC with start of stack
06	33	Exchange with lo byte of pointer 3
07	C701	Load AC from stack & increment ptr
09	9A00	Return if zero character
0B	C906	Output to LEDs and printer
0D	8F90	Delay for teleprinter
0F	9200	Return to continue
11	0208	Stack begins: CR LF
13	1F1F	LTRS LTRS
15	070C	M I
17	060C	N I
19	0414	SP S
1B	0E18	C A
1D	070D	M P
1F	040D	SP P
21	0A0C	R I
23	0C01	N T
25	100A	E R
27	00	NUL

The author's short message transmitting routine, for checking your teleprinter.

The organisation of the UART is such that its data inputs appear to the microprocessor as a parallel data output. The diagram shown has the UART hardwire programmed for five bits in Baudot format. UART pins 26 to 30 are connected to the data bus lines DB0 to DB4, which can be accessed through holes in the Mini Scamp PCB. (For eight bit ASCII, all of the data lines should be run, in order, to pins 26 to 33.)

The converter uses the same simple address decoding as appears in the Mini Scamp, implemented in 7410 triple input NAND gates. Other taps have to be taken off the PCB from the highest order address bit (A11), NWDS, NHOLD and A2 (the third address bit). These lines are combined and used as the input to pin 23, the transmit data strobe or TDS input of the UART.

Upon being pulsed at pin 23, the UART receives the data at its parallel inputs and begins sending it in serial form from its serial output, pin 25. The data is preceded by a "start" bit and followed by a 1½-unit "stop" bit, this being the normal asynchronous data format used by teleprinters and other serial terminals using Baudot code.

At the same time that serial transmission commences, the UART provides a low logic level on its TBMT (transmit buffer empty) and TEOC (transmit end of character) outputs (pins 22 and 24).

The address gating used to drive pin 23 of the UART effectively gives it the hex address 0804, so that data is fed to the teleprinter simply by writing it into this address. Programming is thus very similar to that for Mini Scamp's front panel LEDs, which are at address 0802.

Although the prototype unit was only used as a serial output, the UART can very easily be used to receive serial data from the teleprinter as well. This is done by disconnecting the teleprinter keyboard from the circuit shown and connecting it to a simple one-transistor interface feeding the RSI input of the UART (pin 20). The parallel outputs of the receive section of the UART are then connected to Mini Scamp's data bus lines, in parallel with the transmitter bits. The pins for the data bits are pins 8-12, with pin 12 connected to DBO, pin 11 to DB1 and so on.

The ODA output (pin 19) of the

Economic Digital Control Pty Ltd

PO Box 817
Crows Nest 2065 NSW

WE ARE NOW DEALERS AND STOCKISTS FOR JADE COMPUTER PRODUCTS OF THE USA.

PLEASE SEND SAE FOR CATALOGUE AND PRICE LIST.

Micro Computers

HORIZON II computer with Z80a, 16k RAM, Real Time clock, 2 serial and 2 parallel ports, 2 Shuggart SA400 double density disk drives (180k/diskette of formatted storage) with Northstar Basic, DOS, Monitor Programs, I/O routines.
KIT .....$2400 + 15% sales tax
Assembled and tested with 12 month warranty .. $3,590 + 15% sales tax
Additional disk drives and memory available. Send SAE for details.

WE ALSO HAVE OUR OWN 8" DISC DRIVE SYSTEM.

PLEASE SEND FOR DETAILS.

Office Data System

Computer (with 48k RAM) and dual 8" disc drives. Terminal (80 chr by 24 lines, ASCII keyboard, separate 19 key numeric pad with letters A to E); Centronics 779-2 printer with tractor feed; CP/m file handling system; Basic Language; utilities; fully assembled and tested with one year warranty.

PRICE ..... $7700 + 15% sales tax

FREE Debtors, Creditors, Payroll and General Ledger programs. All written for Australian conditions.
Other Printers are available — Centronics 780, IP225, Axion 801p.

Software: We have an extensive range of software: Languages (including Pascal, C-Basic, M-Basic, E-Basic, Northstar Basic, Microsoft Disc Basic, Fortran) Word processors, Database packages (CODASYL by Xitan), etc. Send SAE for prices.

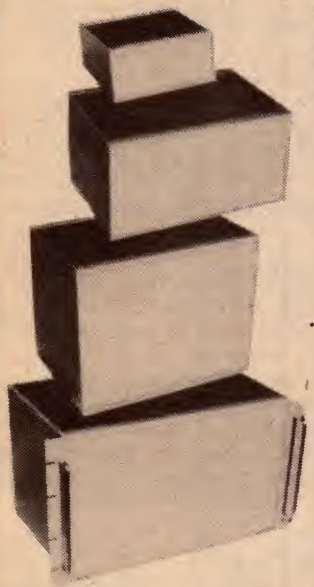
Prices subject to change without notice.

ADAPTABOX

A CASE FOR SOMETHING BETTER!

INSTRUMENT CASES BY

AE ADAPTIVE ELECTRONICS P/L



A RANGE OF CABINETS TO GIVE A PROFESSIONAL APPEARANCE TO THAT SPECIAL PIECE OF EQUIPMENT YOU ARE BUILDING!

The standard cabinet is supplied in kit form and consists of:

(a) Satin anodised 1.6mm aluminium front and back panel, with surfaces suitable for screen printing, etc.

(b) Top and bottom panels of hard wearing black "MARVIPLATE" with a 1.0mm steel base.

(c) Side panels of satin anodised 3.0mm aluminium (m series) and 13mm timber (w series).

(d) Four specially designed aluminium extrusions are used to hold the top, bottom, front and back panels in position. Provision is also available on the extrusion for mounting a metal chassis, circuit boards or edge connectors.

(e) Eight screws . . . four through each end plate to complete the assembly.

Options available are:

(1) The front and rear panels can be replaced with 3.0mm satin anodised aluminium.

(2) The bottom panel can be replaced with 3.0mm satin anodised aluminium.

(3) Side panels can be of the rack mounting type, and with this option handles are also provided.

Cases are suitable for mounting PCBs, Transformers, etc.

There are 13 Standard sizes of metal case ranging from 89 x 178 x 178 mm ($16.34) to 267 x 483 x 280 mm ($49.70).

Special sizes available for quantities of 10 or more.

For further details and prices contact our distributors:

Ellistronics, 289 LaTrobe Street, Melbourne 3000 (Tel. 602-3282)

Stewart Electronics, 33 Sunhill Road, Mt Waverley, Victoria, 3149 (Tel. 277-0622)

Rogers Electronics, 44 Heather Drive, Para Vista, South Australia 5096. (Tel. 08-42 6666)

Interstate outlets required

or contact

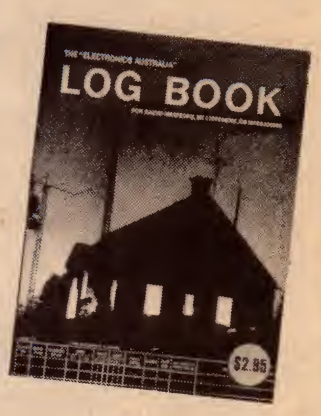
AE ADAPTIVE ELECTRONICS P/L

77 BEACH ROAD, SANDRINGHAM, VICTORIA, AUSTRALIA 3191
TELEPHONE (03) 598-4422
TELEX: 35666

AMATEURS CBers DXers

Buy your copy now of the E.A. LOG BOOK

$2.95



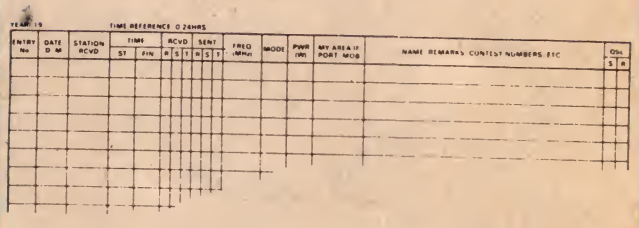
CONTENTS

Frequency Spectrum
Amateur Log Book Requirements
Amateur Repeater Channels
Amateur Codes
Writing DX Reception Reports
CB Operating Conventions
FM Standards, Channels
Amateur Contest Log Sheet
Commonwealth Prefixes
Log Sheets

15 PAGES OF REFERENCE DATA PLUS . . .

57 PRE-RULED LOG PAGES

with space for over 1300 entries



Direct from "Electronics Australia", 57-59 Regent Street, Sydney

OR Send to "Electronics Australia" PO Box 163, Beaconsfield 2014

*There is no extra charge for packing and postage by surface mail within Australia. Outside Australia add 30c. All prices quoted are in Australian currency and all money submitted must be negotiable in Australia

BAUDOT INTERFACE FOR MINI SCAMP

UART should be connected to the interrupt input of the SC/MP, so that the processor knows when there is a character to be taken. The receive section of the UART can be given the effective address 0808 by adding another address decoding network, similar to that shown except that NRDS is used instead of NWDS and address bit 3 is used instead of AD2. The decoder output should be fed to the RDE (received data enable) and RDAR (received data available reset) inputs of the UART, pins 4 and 18.

Timing clock pulses for the UART are generated by a 555 timer IC. For the component values shown the timer runs at 800Hz, which is the frequency required for 50-baud Baudot transmission. Several values can be changed to generate 1760Hz if ASCII conversion is desired. Note also that for ASCII formats some of the pin programming on the UART must be changed.

Because of the simplicity of the circuit, the best construction method is to use Veroboard with either molex pins or a 40-way socket for the UART. The power supply can be taken from Mini Scamp's power buses unless you have the mark two SC/MP chip, in which case an additional -12V supply must be added. This can be constructed according to a circuit shown in the original Mini Scamp article.

The driver part of the circuit is only required for old Baudot machines. This part of the design can be changed according to user needs. For instance the relay could be substituted with a transistor buffer or even omitted completely if the circuit is to be used with a TTL standard VDU. The transistor shown (Q1) can be any general-purpose PNP power type with good switching characteristics. The relay should be a low power 6V type and the supply marked 20V can be anything that is capable of reliably driving the TTY selector magnets.

The programming requirements are very simple. Little more is necessary than a table of the Baudot code or whatever system is being employed. A serial output is obtained by a command very similar to that used to display data on the LEDs. Just as the command C0 02 will write the accumulator contents into location 0802, which is the date LEDs (assuming that pointer register one has been loaded with the value 0800), so too will the command C9 04 write data into location 0804 which is in this case the UART.

The command C9 06 will access both the LEDs and the UART simulatneously, since address lines A1 and A2 both have signals on them at the time of the NWDS pulse. As with the original LED system, these commands are by no means unique; any store instructions that use address lines 11 and 2 will achieve the desired result. If you intend the converter to receive serial as well, then it will be necessary to furnish a handler for the interrupt to process the characters from the keyboard.

CHARACTER		CODE				
LETTERS	FIGURES	B1	B2	B3	B4	B5
A	–	1	1	0	0	0
B	?	1	0	0	1	1
C	:	0	1	1	1	0
D	$	1	0	0	1	0
E	3	1	0	0	0	0
F	! (OR %)	1	0	1	1	0
G	& (OR @)	0	1	0	1	1
H	STOP (OR £)	0	0	1	0	1
I	8	0	1	1	0	0
J	. (OR BELL)	1	1	0	1	0
K	(	1	1	1	1	0
L	)	0	1	0	0	1
M	.	0	0	1	1	1
N	,	0	0	1	1	0
O	9	0	0	0	1	1
P	0	0	1	1	0	1
Q	1	1	1	1	0	1
R	4	0	1	0	1	0
S	BELL (OR ! OR ')	1	0	1	0	0
T	5	0	0	0	0	1
U	7	1	1	1	0	0
V	; (OR =)	0	1	1	1	1
W	2	1	1	0	0	1
X	/	1	0	1	1	1
Y	6	1	0	1	0	1
Z	" (OR +)	1	0	0	0	1
SPACE		0	0	1	0	0
CARRIAGE RETURN		0	0	0	1	0
LINE FEED		0	1	0	0	0
"LETTERS"		1	1	1	1	1
"FIGURES"		1	1	0	1	1

Use this table of the Baudot/Murray code as a guide when writing printer routines.

The only complication that arises in the programming is caused by the time it takes for a mechanical printer to rpint the characters sent to it. This problem is partially solved by running the TEOC pin on the UART to the NHOLD line on the SC/MP. TEOC changes to the low state whenever a character is being transmitted; since it is connected to the NHOLD it has the effect of stopping the SC/MP until the character has been fully sent off and the UART is ready for another.

It was found that for Teletype model 15 machines even tough the UART was prepared for the next transmission, the printer was not and so a software delay is required to allow proper operation. Fortunately this is very easily done with the SC/MP chip because of its delay instructions, which means no complicated timer loops. The exact value of the delay will vary from system to system, but it will probably be around 8F 90. In some systems it may not be required at all.

The setting up and calibration of the unit can be quite lengthy on some printers, because of the number of tension adjustments. The best method is to load a program for printing the alphabet continuously and adjust the 555 clock rate until all of the characters are printed properly. The spring tension of the selector magnets may have to be changed according to the driver voltage and with model 15 machines the range setting on the left hand side may need some attention. The best idea is to set all adjustments so that it operates correctly from the keyboard when in the "local" mode, and then match the converter to those settings with a test programme and the converter set to "line".

Finally, I have included details of a short program to assist in calibration and also to show how the UART output can be used in conjunction with a continuous loop and a data stack. The stack is terminated with a 00 and can have any length. Its contents are continuously printed out until the processor is halted. The data used is for a Baudot machine.

Verbatim™
MINI FLEXIBLE DISKS
MD 525 1-9 $4-25
10up $4
SPECIFY SECTORING OR SYSTEM
OFFER CLOSES 30th April
P&P Incl – add 15% sales tax
(062) 815011
THE BYTE SHOP PO BOX 118., MAWSON ACT 2607
29 COLBEE CRT PHILLIP

2650 mini assembler simplifies programming

Here is a handy "real time" assembler program for small 2650 microcomputer systems. You can use it to load programs directly into memory in mnemonic assembly language — much faster, easier and more reliable than having to do all the detailed coding and displacement calculations yourself!

by JAMIESON ROWE

Programming a computer in machine language tends to be a very slow and tedious business. If you're doing it this way at the moment, you'll know what I mean. It can be challenging enough to work out the basic flow of a program — then you have to sit down and painstakingly slog through the coding, instruction by instruction.

But time and tedium aren't the only problems. When you try running such a program coded by hand, the odds are that you'll find quite a few "bugs" caused by coding errors and mistakes in working out relative addressing displacements.

People using larger computers generally don't need to worry about such problems, because they don't have to program in machine language. In fact many couldn't do so even if they wanted to (which is unlikely), either because they've never learned how or because the operating system on their computer has no provision for loading or running programs in this form!

The closest such folk ever need to come to machine language is assembly language programming, using easy-to-remember mnemonic symbols for the various instructions. An assembler program running in the computer itself is then used to translate this symbolic version of the program into machine language. The assembler takes over all the detailed coding, and works out all of those tedious displacements. Not only that, but it does them much faster and far more reliably than mere humans!

Assemblers for some microcomputer systems have been available for quite a while now, giving users of these systems most if not all of the advantages possessed by larger systems. For industrial and commercial users of the 2650 microprocessor, Signetics themselves provide a "cross assembler" — an assembler for 2650 code which itself runs on another machine.

```
*G1600
2650 LINE ASSEMBLER

0440.*THIS IS A DEMONSTRATION
0440.*
0440.*
0440.    ORG 500
0500.    DATA 5 14
0502.    LODI,R3 FF        SET UP R3 AS INDEX
0504.    LODA,R3 *+500     FETCH CHAR
0507.    COMI,R0 00        CHECK IF EOF (NUL)
0509.    BCTA,EQ @1        LEAVE IF FOUND
050C.    ZBSR *20          OTHERWISE GO PRINT
050E.    BCTR,UN 504       & CONTINUE
0510.@1  ZBSR *25          END: GIVE CRLF
0512.    ZBRR 22           & LEAVE--RETURN TO PIPBUG
0514.    ASCI "HELLO THERE!"
0520.    DATA 0
0521.    END

*G500
HELLO THERE!
```

Fig. 1: A demonstration of the mini assembler in action. As you can see, a program may be run immediately following assembly.

For smaller 2650 systems, more conventional "resident" assemblers have recently become available. A limited-facility "line" assembler called Prometheus was developed by the British Mullard company, and made available in a special ROM/RAM application card. However it was rather too expensive for hobby applications. Similarly an assembler was developed within the 2650 Users' Group in Sydney, but was memory-orientated and required quite a deal of RAM memory. Neither assembler was really well suited for small hobby systems.

Now for the good news. In this article, you will find details of a new 2650 assembler which I believe is almost ideal for small hobby systems. It occupies only 1300-odd bytes, so that it should fit into almost any 2650 system. Yet it will let you perform convenient and fast assembly of programs, from your terminal keyboard and in real time. You type in the mnemonics; it works out the code and plugs it into memory.

As you might expect, it is not a full-scale assembler like those you would find on large systems. It is basically a line assembler, which treats each instruction as a separate entity. But it does offer a very useful feature not found on many small line assemblers: limited forward referencing, which lets a branch instruction reference a memory location not yet known. This means that once you get used to its limitations, you can do almost as many things with this assembler as you can with its bigger brothers.

Incidentally I can't take much of the credit for this assembler. I haven't written it from scratch, but have developed it from a small assembler called PIPLA written by the software people at Signetics. I came across PIPLA last year when I toured the Signetics plant during my trip to California.

The people at Signetics told me they had written PIPLA to go into a special ROM device along with a modified and enhanced version of PIPBUG. When I showed interest in it, they let me have a copy along with a source listing.

I didn't have much of a chance to look closely at PIPLA during the trip but was able to do so when I came home. It didn't take long then to make a rather important discovery. Not unex-

pectedly, PIPLA used quite a few utility routines from the modified PIPBUG — but the modified PIPBUG was so different from the familiar old PIPBUG that the two were virtually incompatible.

Obviously PIPLA in its original form was not going to be all that much use to all those 2650 users who were already committed to the old PIPBUG. If it was to be of value to such people, someone was going to have to sit down and convert it to use the routines in "old PIPBUG" . . . .

Well, the rest is fairly obvious. The job took a while, as it had to be fitted in between more urgent things. There were a few complications, because some of the required routines in the modified PIPBUG were so different from those in the old PIPBUG that the routines in "old PIPBUG" could not easily be used at all. I had to add these to PIPLA itself, at the same time reducing the size of PIPLA wherever possible to minimise the increase in memory space.

Eventually I finished the basic conversion job, and after the inevitable debugging the modified PIPLA began running on my system with "old PIPBUG". But this wasn't quite the end of the story.

Once you got used to its limitations, it was a very handy piece of software. But there were a few mildly irritating little shortcomings. When you called it, it simply printed out a suggested initial "origin" or starting address for assembly. Wouldn't it be nicer if it announced itself with a suitable message?

Similarly, it lacked a facility for accepting numbers and other data constants, in hexadecimal. Wouldn't it be nice if it had a "DATA" directive like bigger assemblers?

To cut a long story short, these facilities were added and the result is presented here. Based on PIPLA but with quite a bit of modification and a couple of additional features, it is quite a capable little assembler. Certainly you should find it a big step forward in speed and convenience if you're still programming in machine language.

What will it do? Well, it will accept all of the standard 2650 instruction mnemonics — LODA, STRR, BCTA, BSTR and so on. It can also recognise all of the commonly used register/condition code mnemonics R0, R1, R2, R3, P, Z, N, LT, EQ, GT and UN. It will accept symbols for indirect and indexed addressing, up to 10 label symbols for forward referencing, four different pseudo-operation or assembler directives, and comments.

The input format required by the assembler for the symbolic source lines is:

LBL OPC R/C SYM OPND

where the symbols have the following meaning:

```
15CC F4 0C 18 02
15D0 45 1F 6D 04 2A 1F 17 5B F4 04 98 0F 3F 1A 95 CE
15E0 84 0D 3B 0F EF 04 29 9A 25 1B 71 3B F0 1B 1D 02
15F0 69 1A CD 0D 04 0D 0E 04 0E DA 02 D9 00 1F 00 A4
1600 20 07 14 CF 5A 40 5B 7B 3F 1A 55 C0 3B F0 0D 04
1610 0D 3B DC 0D 04 0E 3B D7 04 2E BB A0 3B D3 0C 1A
1620 02 E4 2A 18 69 E4 40 98 3C 0F 3A 02 A4 30 1E 02
1630 50 C3 E7 09 19 F9 D3 06 01 0F 7A 40 CC 04 0F C1
1640 0F 7A 41 CC 04 10 61 18 1A 0C 84 0F CF 7A 40 0E
1650 E4 0F CF 7A 41 0C 04 0D CC 84 0F 0C 04 0E CE E4
1660 0F 1B 56 07 02 20 CC 04 2A 3B BE 3F 17 7A CC 04
1670 11 60 9A 2B 44 0F 1C 00 22 F4 02 98 9C 3B AA 0F
1680 7A 02 C2 0F 3A 02 EF 04 29 9E 16 0E E2 18 FB CC
1690 84 0D 02 3F 15 F3 C2 1B 6A 15 D8 C0 C0 1A 95 CE
16A0 84 0D E4 10 9A 21 87 01 3F 17 6B 0F 7A 02 E4 40
16B0 99 0A 3F 17 7A 84 10 18 05 1F 02 50 3B DF 46 03
16C0 0C 84 0D 62 CC 84 0D 3B CB 0C 04 11 F4 01 1C 16
16D0 0E F4 02 1C 17 22 3B D1 0F 7A 02 E4 30 9A 1B 87
16E0 01 05 FF ED 37 CF 18 06 E5 04 1A 77 1B CC D1 D1
16F0 D1 D1 D1 6D 04 2A C9 FC 1B 5C E4 40 98 24 0F 3A
1700 02 A4 30 1E 02 50 C3 E7 09 19 F9 D3 0F 7A 40 C1
1710 0F 7A 41 C2 0C 04 0D CF 7A 40 0C 04 0E CF 7A 41
1720 1B B7 3F 1A 95 0C 04 11 F4 08 18 AD F4 04 98 24
1730 77 09 A6 01 A5 00 77 01 AE 04 0E AD 04 0D 75 08
1740 18 0D 85 01 9C 02 50 F6 C0 98 FA 46 7F 1B 05 04
1750 C0 42 98 F1 6E 04 2A 1B 0A 15 CC CD 84 0D 02 3F
1760 15 F3 C2 CE 84 0D 3B F8 1F 16 0E 04 20 FB 00 EF
1770 3A 02 18 7B EF 04 29 9A CC 17 06 FC A7 01 0F 3A
1780 02 EB F2 9A 0D E4 30 1A 09 CE 79 40 DA 70 87 01
1790 1B 07 04 20 CE 79 40 DA 7B CF 04 28 75 01 77 08
17A0 05 17 06 D4 CD 04 0F CE 04 10 07 FF 0F A4 0F 1C
17B0 02 50 EF 7A 3C 18 06 86 06 85 00 1B 67 E7 03 1A
17C0 6B 0F A4 0F C2 0F A4 0F 0F 04 28 75 08 17 00 2C
17D0 2B 2D 23 2A 52 30 20 20 00 F0 52 31 20 20 01 F0
17E0 52 32 20 20 02 F0 52 33 20 20 03 F0 50 20 20 20
17F0 01 F0 5A 20 20 20 00 F0 4E 20 20 20 02 F0 4C 54
1800 20 20 02 F0 45 51 20 20 00 F0 47 54 20 20 01 F0
1810 55 4E 20 20 03 F0 45 4E 44 20 00 80 4F 52 47 20
1820 00 81 41 53 43 49 00 82 4C 4F 44 5A 00 01 4C 4F
1830 44 49 04 02 4C 4F 44 52 08 04 4C 4F 44 41 0C 08
1840 53 54 52 5A C0 01 53 54 52 52 C8 04 53 54 52 41
1850 CC 08 49 4F 52 5A 60 01 49 4F 52 49 64 02 49 4F
1860 52 52 68 04 49 4F 52 41 6C 08 41 4E 44 5A 40 01
1870 41 4E 44 49 44 02 41 4E 44 52 48 04 41 4E 44 41
1880 4C 08 45 4F 52 5A 20 01 45 4F 52 49 24 02 45 4F
1890 52 52 28 04 45 4F 52 41 2C 08 42 43 54 52 18 04
18A0 42 43 54 41 1C 0C 42 43 46 52 98 04 42 43 46 41
18B0 9C 0C 43 4F 4D 5A E0 01 43 4F 4D 49 E4 02 43 4F
18C0 4D 52 E8 04 43 4F 4D 41 EC 08 41 44 44 5A 80 01
18D0 41 44 44 49 84 02 41 44 44 52 88 04 41 44 44 41
18E0 8C 08 53 55 42 5A A0 01 53 55 42 49 A4 02 53 55
18F0 42 52 A8 04 53 55 42 41 AC 08 52 45 54 43 14 01
1900 52 45 54 45 34 01 42 53 54 52 38 04 42 53 54 41
1910 3C 0C 42 53 46 52 B8 04 42 53 46 41 BC 0C 52 52
1920 52 20 50 01 52 52 4C 20 D0 01 43 50 53 55 74 12
1930 43 50 53 4C 75 12 50 50 53 55 76 12 50 50 53 4C
1940 77 12 42 52 4E 52 58 04 42 52 4E 41 5C 0C 42 49
1950 52 52 D8 04 42 49 52 41 DC 0C 42 44 52 52 F8 04
1960 42 44 52 41 FC 0C 42 53 4E 52 78 04 42 53 4E 41
1970 7C 0C 4E 4F 50 20 C0 11 48 41 4C 54 40 11 54 4D
1980 49 20 F4 02 57 52 54 44 F0 01 52 45 44 44 70 01
1990 57 52 54 43 B0 01 52 45 44 43 30 01 57 52 54 45
19A0 D4 02 52 45 44 45 54 02 5A 42 53 52 BB 10 5A 42
19B0 52 52 9B 10 54 50 53 55 B4 12 54 50 53 4C B5 12
19C0 4C 50 53 55 92 11 4C 50 53 4C 93 11 53 50 53 55
19D0 12 11 53 50 53 4C 13 11 42 53 58 41 BF 1C 42 58
19E0 41 20 9F 1C 44 41 52 20 94 01 4C 44 50 4C 10 1C
19F0 53 54 50 4C 11 1C 44 41 54 41 00 84 00 00 00 00
1A00 00 00

1A55 05 1A 06 6C 3F 00 A4 07 FF 0F A4
1A60 0D 18 04 BB A0 1B 77 05 04 06 40 17 32 36 35 30
1A70 20 4C 49 4E 45 20 41 53 53 45 4D 42 4C 45 52 0D
1A80 0A 0A 00 00 A4 30 1A 0A E4 0A 16 A4 07 1A 03 E4
1A90 10 16 1F 02 50 20 C1 C2 CC 04 12 08 FC 15 EF 04
1AA0 29 14 0F 7A 02 E4 20 98 02 DB 70 3B 57 D2 D2 D2
1AB0 D2 CE 04 28 46 F0 62 C2 D1 D1 D1 D1 45 F0 08 F2
1AC0 44 0F 61 C1 04 01 C8 D1 DB 54 0A 0D 5E 07 00 E7
1AD0 3C 1C 00 1D 3F 02 86 E4 7F 98 0A 03 18 71 0F 5A
1AE0 02 BB A0 1B 6A 05 03 ED 7A C9 18 09 F9 79 CF 7A
1AF0 02 BB A0 DB 5A CF 04 29 CD 04 2A 07 00 9B A5
```

Fig. 2: A complete hex listing of the assembler. The gap from 1A02 to 1A54 is occupied by the input and labels buffers.

commodore PET 2001 Computer IS HERE!

MEMORY
Random Access Memory (user memory): 8K included. Expandable to 32K bytes externally.
Read Only Memory (operating system resident in the computer): 13K bytes
8K BASIC interpreter
4K — Operating system
1K — Diagnostic routine

VIDEO DISPLAY UNIT
9" enclosed, black and white, high-resolution CRT
1000 character display, arranged 40 columns by 25 lines
8 x 8 dot matrix for characters and continuous graphics
Automatic scrolling from bottom of screen
Winking cursor with full motion control
Reverse field on all characters (white on black or black on white.
64 standard ASCII characters; 64 graphic characters

KEYBOARD
9½" wide x 3" deep; 73 keys
All 64 ASCII characters available without shift. Calculator style numeric key pad
All 64 graphic and reverse field characters accessible from keyboard (with shift)
Screen Control: Clear and erase
Editing: Character insertion and deletion

CASSETTE STORAGE
Fast Commodore designed redundant-recording scheme, assuring reliable data recovery
Cassette drive modified by Commodore for much higher reliability of recording and record retention
High noise immunity, error detection, and correction
Uses standard audio cassette tapes
Tape files, named

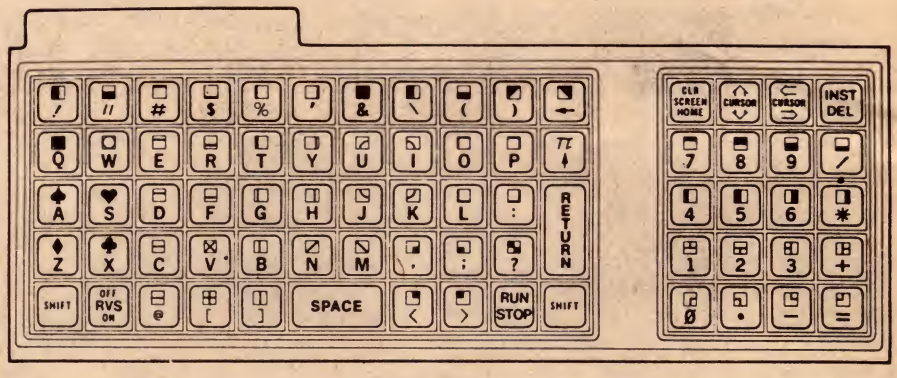
OPERATING SYSTEM
Machine language accessibility
File management in operating system

Cursor control, reverse field, and graphics under simple BASIC control
Cassette file management from BASIC
Pseudo random number Generator

INPUT/OUTPUT
All other I/O supported through IEEE-488 instrument interface which allows for multiple intelligent peripherals
All I/O automatically managed by operating system software
Single character I/O with GET command
Easy screen line-edit capability
Flexible I/O structure allows for BASIC expansion with intelligent peripherals

$995

Housed in a solid metal cabinet complete with VDU and cassette drive.



the PET keyboard

The PET keyboard consists of 73 keys. There are the usual alphanumerics (A-Z and 0-9) found on typewriters and calculators and many computers.
But the PET has something more: 64 graphic characters. The graphics can be used for plots, for fun and games, or for artwork.
There are also special screen and keyboard control keys which allow the moving of the cursor in four directions, the reversing of characters and background, the inserting and deleting of characters. Shift keys and a run/stop key are also provided to facilitate keyboard operations.
By the use of POKE command lower case letters are obtained instead of the graphic symbols above the capital letter keys.

BASIC INTERPRETER
Expanded 8K BASIC; 20% faster than most other 8K BASICS
Upward expansion from current popular BASIC language
Strings, integers and multiple dimension arrays
10 significant digits; floating point numbers
Direct memory access through PEEK and POKE commands
Dimensions: 16½" wide by 18½" deep, 14" overall height
Weight: 44lbs

DISTRIBUTED BY:

Radio Parts Group

562 SPENCER STREET, WEST MELBOURNE (03) 329 7888
1103 DANDENONG ROAD, EAST MALVERN (03) 211 8122

LBL is an optional label; if present it must be one of the labels used in the operand field of a previous instruction, for forward referencing.

OPC is the instruction or pseudo-operation mnemonic; the standard 2650 mnemonics are used, as given in the Signetics manual.

R/C is the register or condition code, if one is required; either the symbols given earlier may be used, or a single-digit hexadecimal number.

SYM is a special symbol or symbols to indicate indirect addressing and/or indexing, if required.

OPND is the operand for the instruction; it may be a hexadecimal data number or an address, and if an adress it may be given either as a hex number or one of the labels for forward referencing. In the case of relative addressing, the assembler expects an absolute hex address, and will calculate the required displacement. The only exception is for ZBRR and ZBSR instructions, where the actual displacement must be typed in.

Each of the above symbol fields should normally be separated from those adjacent by one or more spaces. If the label field is not used, a leading space is not required although one or more spaces may be used if desired for appearance. The separator between the OPC and R/C fields may be a comma instead of a space, and the space between the SYM and OPND fields may be omitted if desired.

If the first character of a line is an asterisk (*), the assembler assumes the line is a comment only and ignores it. A comment line may have up to 56 characters apart from the asterisk.

The symbols used to indicate indirect addressing and indexing in the SYM field are as follows:

'*' Means indirect addressing.

'#' Means normal indexing. Note, however, that when indexing is specified the index register must be given in the R/C field, unlike the normal assembler format. This is no real problem since R0 is always the implied source/destination register for indexed instructions.

'+' Means indexing with auto-increment. Again the index register must be given in the R/C field.

'—' Means indexing with auto-decement. The index register must be given in the R/C field.

Where indirect addressing and indexing are to be specified in the one instruction, the two appropriate symbols are used together with the indirect addressing symbol given first. For example:

```
LODA,R3 *+8A0
```

which is a load indirect through address X'8A0, using R3 as the index register and with auto-increment. Thus R3 will be incremented and added to the address found in location 8A0 to generate the final effective address for the instruction.

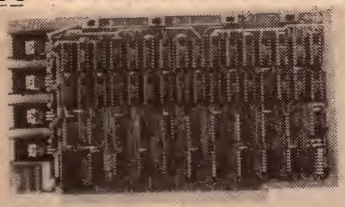
The function of the label operators is to help you in writing forward memory references. That is, references in the operand field of instructions to locations in the program which have yet to be fed in, and are therefore not known in terms of their exact absolute address.

There are restrictions on the use of the label operators, as follows. They can only be used in the OPND field of branch instructions, and they cannot be used in relative addressing instructions. Nor can they be used with indirect addressing or indexing. This limits the use of the labels fairly severely, but they can still be quite handy.

Ten different label operators are allowed, represented by the symbols @0—@9. Each one can be used in the operand field of instructions any number of times before it is finally defined by specifying it in the label field of an instruction or pseudo-op. Note that all references to a label must precede its definition, due to the way in which the assembler handles the labels.

"THE S100 BUS STOP" T.M.

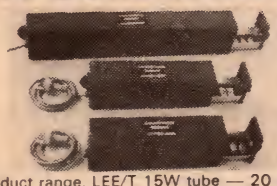
S100 16K STATIC RAM KIT



ETI 642

16K, 2114, Low Power 1.2 Amps Typ. for 16K, 300 or 450nS, 4K addressing, 4K write protect switches, Cromemco bank select, wait states, plated thru holes, solder mask. See FEB. E.T.I. project for details. Assembled and tested $366.00, $5.00 P&P Reg. mail.

UV EPROM ERASERS



New product range. LEE/T 15W tube — 20 min. timer — up to 40 eproms — will erase in 10/15 min. Model MEE/T — 8W tube — 20 min. timer up to 10 eproms — will erase in 20/30 min. Model MEE is the same as MEE/T but with no timer. All erasers have safety cut out switch.
PRICE: LEE/T $105.00, MEE/T $83.47, MEE $73.90, P&P $3.00.

S100/6800 CHASSIS

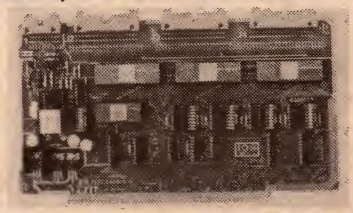
11 Slot back plane, 10 amp. power supply, fan, key switch, bench mount, rack mount, fully card guided, anodised alum.

Basic Bench Mount Kit	$189.00
Power Supply S100 Kit 8V, +16V, —16V	$ 79.00
Accessory Kit	$ 46.00
Basic Rack Mount Kit	$166.00
Reg. Power Supply 6800 Kit 5v, +12V, —12V	$104.00

Sent F.O.B. Overnite Transport

S100 16K Eprom Board Kit	$90.00	P&P $3.00
S100 Z80 4 MHz CPU Board Kit	$149.00	P&P $3.00
S100 Floppy Disc Controller Kit	$159.00	P&P $3.00
S100 8 Slot Back Plane	$22.50	
S100 11 Slot Back Plane	$36.00	
S100 Active Termination Board	$33.50	
S100 Sockets	$8.00	
S100 Wire Wrap Board	$22.50	
S100 Extender Board Kit	$28.50	
Number Cruncher Kit (MM57109)	$49.50	
Paper Tape Reader Kit	$69.50	
Front Panel Display Kit	$87.50	
8080 Single Step Control Kit	$21.65	

S100 I/O PORT BOARD



9 Parallel Ports (programable), 1 Serial Port-TTY, RS232 or TTL. Baud rate generator 9600 to 75, fully address decoded, low power buffers, plated thru holes, solder mask.
KIT PRICE $164.00 P&P $3.00.

DISC DRIVES

Shugart SA400 Mini	$355.00	P&P $5.00
Shugart SA800	$580.00	P&P $5.00
6800 PRODUCTS		
6800 11 Slot Back Plane	$36.00	
6800 11 Slot Chassis (Basic)	$166.00	
6800 Active Termination Board	$33.50	
6800 Extender Board Kit	$22.50	
2708 EPROMS (ceramic)		
450nS, guaranteed quality	$12.00	
2716 Eproms (single supply)	$43.50	
2114 RAMS Low Power Hitachi, Super Rams		
450nS with 300nS available	$8.50	

Send 60c in stamps for computer printout catalogue for full production information and price list.
All products Aust. made and ex-stock (almost).
Dealer enquiries welcome.

SM ELECTRONICS MELBOURNE

bankcard

Give name, number, expiry date and signature. For mail order sales.

BUILT AND TESTED P.O.A.
ALL PRICES ADD 15% S.T. IF APPLICABLE

S.M. ELECTRONICS
10 STAFFORD CRT. DONCASTER EAST, VICTORIA, 3109
BOX 19 DONCASTER EAST, 3109.
PHONE (03) 842 3950.

However after being defined a label operator may be re-used again.

As mentioned earlier, the assembler recognises four different directives, or pseudo-operators. These are basically instructions to the assembler itself, rather than symbolic instructions to be assembled into machine code. The four directives recognised are as follows:

ORG is a directive to the assembler to reset its program counter; i.e., the pointer which the assembler uses to store the assembled program instructions into memory.The format of this directive is

ORG nnnn

where 'nnnn' is a hexadecimal number specifying the new program counter value. Leading zeroes are not required.

ASCI is a directive to the assembler to store in memory a string of alphanumeric characters, in ASCII code. Following the directive mnemonic the assembler skips any leading spaces, then takes the next character it finds as a string delimiter. All of the following characters up to the next occurrence of the delimiter character are then stored as an ASCII string. The actual string may be up to 52 characters long. The format for this directive is thus

ASCI < delim >< string >< delim>

DATA is a directive to the assembler to store one or more data bytes in memory, beginning at the location given by the current value of the assembler's program counter. The directive format is

DATA nn nn nn nn nn nn nn . . .

where each 'nn' is a two-digit hexadecimal number, and the numbers are separated by spaces. If an error is made while typing a number, it may be corrected merely by typing in the two correct digits before the terminating space. Leading zeroes are not required. Up to 18 data bytes may be entered on a line if no corrections are made.

END is the directive which is used to indicate to the assembler that no further source material is to be assembled. When this directive is encountered the assembler returns to PIPBUG.

If desired, comments may be added after the operand field on most source lines, providing the comments are separated from the operand by at least one space. The only type of source line where this cannot be done is one consisting of a DATA directive, as the assembler searches to the end of the source line for data numbers for this directive. No special symbol is required to distinguish comments following source instructions or directives.

The assembler resides in memory from location 15CC to 1AFE, inclusive. Part of this range is not used by the program itself, but is used as a line input buffer, scratchpad and label buffer area (1A02—1A54). The initial starting address is 1600, so after loading into memory the assembler is called by giving PIPBUG the command G1600r (where "r" is carriage return).

When called, the assembler first types out an identifying message: "2650 LINE ASSEMBLER". It then types out a suggested initial origin, which is X'0440 — the start of the available RAM above PIPBUG's scratchpad area. If you don't wish the assembled program to start at this address, you can immediately change the program counter to another value by using the ORG directive.

You can now type in your program to be assembled, line by line. When you conclude each line with the usual carriage return, the assembler will attempt to assemble it. If you have made no format (syntax) errors and it can do so, it will indicate this and its ability to accept a further line by typing the new value for its program counter at the start of the next line. You thus get a continuous indication that all is well, along with an indication of the memory space being used by your program.

If you make a format error and the assembler cannot assemble the line, it will abort and return to PIPBUG via the '?' error message routine. After working out what went wrong, you can return to continue the assembly by either re-starting at address 1600, or by starting at address 160E. The latter preserves any forward reference labels you may have been using, although the assembler's program counter is disturbed. You thus have to reset it with an ORG directive.

I have prepared a small demonstration of the assembler's use, which is shown in Fig. 1. As you can see the program assembled is a very short message printing routine which starts at X'0500, but its assembly illustrates most of the things you need to know about the assembler and the way it is used.

Note that the first three input lines are comments, which are effectively ignored by the assembler. Note also the way the assembler prints out the current value of its program counter at the start of each line, so that you can see how much memory the program is taking up. Needless to say you also make use of these addresses when typing in backward-referencing operands — an example of this is shown in the line commencing at address 050E.

Finally, note that after assembly, the program which had just been assembled was called from PIPBUG by typing G500. It then ran, typing out the simple message "HELLO THERE".

Needless to say, once you have assembled a program and checked that it runs, you can dump it in the normal way to cassette tape or paper tape using the normal PIPBUG dump routine.

Well, there it is — a small but very practical assembler which should make programming your 2650 very much easier. Incidentally for those who would like to analyse the assembler's operation in detail, full source listings will be available from our Information Service for a fee of $4.00, to cover photocopying and postage.

MICROCOMPUTER

* DID YOU KNOW THAT S.W.T.P.C. HAVE NEW & EXCITING PRODUCTS BASED ON THE MOTOROLA 6800,6809 (VERY SOON)

* MP-68/2 MICROCOMPUTER KIT
* CT-82 INTELLIGENT TERMINAL,ASSEMBLED
* CT-64 TERMINAL KIT (WITHOUT VDU MONITOR)
* MF-68 DUAL MINIFLOPPY DISK SYSTEM KIT
* DMF-1 DUAL DISK SYSTEM 8" ASSEMBLED
* AC-30 CASSETTE INTERFACE KIT
* PR-40 PRINTER KIT

* WE SPECIALISE IN PERIPHERALS FOR MICROCOMPUTER SYSTEMS,ALSO 6800 SOFTWARE FOR BUSINESS & HOBBY APPLICATIONS

SWTPC
FOR FURTHER INFORMATION PLEASE PHONE 31 3273
OR WRITE TO:
P.O. Box 380, Darlinghurst NSW 2010

COMPUTER COMPONENTS

S100 BOARDS

ETI 640 VIDEO DISPLAY BOARD

- ETI May 1978
- 16 lines — 64 characters
- Memory mapped software controlled
- Upper — lower case

PCB Epoxy glass plated through holes hard gold plated contacts **$24.00**
KIT complete **$94.00**

8803 VECTOR 11 SLOT MOTHER BOARD

- Board comes with 12 tantalum capacitors and instruction to set up for active or passive terminations. G10 epoxy glass board with 2oz copper. Solder plated circuitry plus solder mask to prevent accidental short circuits. **$39.00**

WW1 PROTOTYPE BOARD

- Capacity 70 14 pin sockets
- Optional split power rail
- Ideal for wire wrapping or direct solder wiring
- Full bussed ground plane
- Full plated through holes. Gold plated edge connector **$24.50**

8 KSR 8K RAM BOARD

- **Uses 2102 type RAMS.**
- **Fully buffered address, control and data lines.**
- **Selectable waite states 0, 1, 2, 3.**

PCB with manual $39.50
Manual only (refundable) **$5.00**

CPZ80 Z80 PROCESSOR BOARD

- **On-board 2708 EPROM.**
- **Power-on-jump to any 4K boundary above 32K — RAM — ROM or the on board 2708.**
- **2MHZ on 4MHZ operation.**
- **Selectable wait states.**
- **Selectable 8080 or Z80 1/0 addressing modes.**
- **Status signals are latched per S100 bus specification.**

PCB with manual $44.50
Manual only (refundable when board purchased) **$5.00**
Kit complete with manul 4MHZ **$**
Built and tested 2MHZ board **$175.00**

DIBI DISC CONTROLLER BOARD

- Controls up to 4 single or double sided drives.
- Data protect features include automatic disable of write — gate during power down for data integrity.
- Supported by a reliable software package K2 FDOS and complete diagnostic documentation.

PCB with manual **$44.50**
Manual only (refundable) **$5.00**

CPUI 8080A PROCESSOR BOARD

- **8 level vector interrupt.**
- **Uses 8224 clock generator.**

PCB with manual $39.50
Manual only (refundable) **$5.00**
Kit complete $110.00

REAL TIME CLOCK FOR S100 BUS

- Two independent interrupts. Software programmable. One in 10 *u* sec. Step, the other in 100 *u* sec. to 10 seconds
- Uses on board IMHZ XTAL oscillator. PCB with manual and sample program **$39.00**

EP 16K EPROM BOARD

- **Accepts up to 16 2708 or 2716.**
- **Addressable to any 16K boundary.**
- **Only Eproms installed need be enabled. Unused locations may be allocated for RAM.**
- **Selectable wait states 0, 1, 2, 3, 4.**
- **All S100 lines fully buffered.**

PCB BOARD with manual .. $36.50
Manual only (refundable when PCB purchased **$5.00**

Also available build and tested (less Eprom) **$110.00**

MOTOROLA D2 — EXORCISER COM BOARDS

MOTOROLA BUS MOTHER BOARD

- **9 SLOT BACK PLANE**

See E.A. Feb 1979 for full details of this board.
PCB $39.00
Built and tested **$99.00**

6800 PROTOTYPING BOARD

- **Double sided expoxy glass board.**
- **Gold plated edge connectors.**
- **Designed for wire wrapping or direct soldering $24.50**

CARD CAGE

- **See E.A. Feb. 1979 for full details.**
- **Takes out 9 slot mother board.**
- **Space for power supply.**

Card cage $34.00
Card guides per pair **$0.50**

VIDEO DISPLAY BOARD D2—6800 COMPATIBLE

- Electronics Australia Aug. 1978
- 16 lines 32 characters.
- Memory mapped — software controlled.

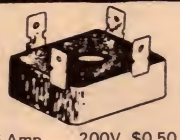
PCB epoxy glass gold contacts **$14.50**
KIT complete **$45.50**

EXTENDER BOARD

- Double sided epoxy glass
- Gold plated contacts.
- Complete with socket.

$22.00

BRIDGE RECTIFIERS



W02	1.5 Amp	200V $0.50
W04	1.5 Amp	400V $0.60
W06	1.5 Amp	600V $0.70
KBPC 602	6 Amp	200V $1.50
KBPC 606	6Amp	600V $1.75
KBPC 1002	10 Amp	200V $1.95
KBPC 1004	10 Amp	400V $2.25
KBPC 3502	35Amp	200V $2.60
KBPC 3504	35 Amp	400V $2.95

All prices plus 15% sale unless otherwise indicated.
Please add sufficient freight. Any excess refunded.

Heavy items sent Comet. Freight collect. Prices and specifications subject to change without notice. We reserve the right to supply substitute parts if advertised parts unavailable.

WIRE WRAP IC SOCKETS

Gold plated 3 level wrap.

	100+	10-99	1-9
8 PIN	36	39	42
14 PIN	57	62	66
16 PIN	65	70	74
18 PIN	74	83	90
20 PIN	1-16	1-18	1-20
22 PIN	1-06	1-10	1-20
24 PIN	97	1-05	1-30
28 PIN	1-47	1-67	1-82
40 PIN	1-65	1-76	1-96

MICROCOMPUTER 1C

8080A	$8.95	F8 CPU	$24.95
8085	$24.00	2102	$0.85
8212	$4.15	2114 1-9	$7.00
		10+	$6.50
6800P	$8.93	2708	$11.50
6802P	$14.05	Z80A 4MHZ	$18.50
6810P	$4.32	6821P	$4.86
		6850P	$3.94
		Z80 Technical Manual	$8.50

WIRE WRAP WIRE

Silver plated solid conductor

- WD30 Dispenser contains 50ft wire also cuts and strips **$5.08**
- WD30W Replacement 50ft wire for WD30 ..... **$2.60**
- KW1000 30 gauge **KYNAR** wire 1000 ft spools (specify red-blue-black-white-orange-green-yellow-purple-grey) **$17.50**

TW1000 30 gauge **TEFLOW** wire 1000ft spools colours as above **$21.00**

Cut and striped wire available ex-stock please. Write for full price list.

WK2 Kit **$16.69**
WSU3 hand wrap unwrap tool $8.50
ST100-30 cut and striping tool ..... $13.30 (tax ex.)
ST3907-30 cut and striping tool ..... **$11.00** (tax ex.)
BW640 batty powered tool **$47.81** (tax ex.)

LOGIC PROBES

CONTINENTAL SPECIALITIES CORPORATION

LP2	1.5 MHz max input	**$36.00**
LP1	10 MHz max input	**$52.00**
LP3	50 MHz max input	**$69.95**
DP1	Digital pulser with autopolarity pulse sensing	**$74.95**

10 TURN POTENTIOMETERS

Stock resistance values (OHMS) 10, 25, 100, 500, 1K, 2K, 5K, 10K, 20K, 50K, 100K.

Spectrol model 534 standard ¼" shaft
Price 1—9 ..... **$6.75**
10+ **$5.75**
Values may be mixed

WIRE WRAP PINS

WWT 1 · .025 square post · 3 level wire-wrap · Gold plated

		Per Hundred
WWT—1	Slotted head	**$15.00**
WWT—2	Single sided	**$4.00**
WWT—3	1 C socket head	**$15.00**
WWT—4	Double sided	**$5.00**

CERMET SINGLE TURN TRIM POT

Spectrol model 63P
ACTUAL SIZE

STOCK VALUES
10, 20, 50, 100, 200, 500, 1K, 2K, 5K, 10K, 20K, 50K, 100K, 200K, 500K, 1M, 2M.
1—9 ..... **$0.85**
10+ **$0.75**
Values may be mixed.

15 TURN TRIM POT

ACTUAL SIZE

STOCK VALUES
10, 20, 50, 100, 200, 500, 1K, 2K, 5K, 10K, 20K, 50K, 100K, 200K, 500K, 1M, 2M.

1—9, **$1.10** 10+, **$0.98**

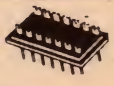
Values may be mixed.

P.C. EDGE CONNECTORS

S100 gold plated wirewrap **$5.50**
S100 gold plated solder tail **$4.90**
D2 Motorola bus
43/86 .156 gold solder tail **$6.34**
43/86 .156 w/wrap **$6.95**

We can supply all your edge connector requirements from 2 to 85 pin in both .156 and .1 spacing. Please send for price sheet.

DIP PLUGS



Ideal for use with flat ribbon cable or to mount components on.

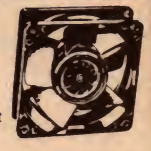
14 pin **$0.56** 24 pin **$0.94**
16 pin **$0.58** 40 pin **$2.00**

POWER TRANSFORMERS

SPECIALLY DESIGNED FOR MICROCOMPUTERS

- See Feb 1979 E.A. for full details
- Good regulation.
- Electrostatic shield.
- SE 805
  8V @ 5A 2x14V @ 1A **$14.00**
- SE 810
  8V @ 10A 2x15V @ 1A **$19.00**
- 820
  8V @ 20A 15V @ 1A
  15V @ 3A **$28.00**

COMPUTER COOLING FANS



- Popular Muffin fan.

Standard size 4.68" square. 110 volt or 240 volt available **$24.50**

STEWART ELECTRONICS

33 SUNHILL ROAD, MT. WAVERLEY 3149
Phone (03) 277 0622
Mon.-Fri. 9am-6pm
Sat. 9am-12noon

Lunar Lander game

This moon landing game program is written in TCT BASIC, and can be run on the 2650 Mini Computer. It is quite realistic, taking into account the moon's gravity, and the decreasing mass of the lunar lander as the fuel is used up. It also has limits on both the rate of fuel usage and the acceleration to which the lander is subjected.

by DAVID EDWARDS

Moon landing is a simple mathematical game which has been played on computers from the very early days. In its simplest form, as described here, all that is required is a terminal capable of displaying about 16 lines of text.

The scenario is that the operator (LEM pilot) is in the lunar lander a specified distance above the lunar surface. The LEM has a certain initial velocity, and a quantity of fuel. The pilot has to specify when and how much fuel to use, so that the LEM can be made to land on the moon with zero, or at least minimal, speed.

It sounds quite simple, doesn't it! But you will probably change your mind once you have actually tried to do it, as there are a number of traps for unwary pilots.

First of all, you can simply run out of fuel before the LEM reaches the surface. Once this happens, the LEM simply drops, and digs a big crater (this is quite soundless however, as there is no atmosphere on the moon to support soundwaves!).

If you specify too high a fuel rate, one of two things can happen. Firstly, you may overload the motor, causing a burnout, followed by a long drop to the moon, and another big crater. Or you could exceed the allowable G forces on the LEM. In this case, it will simply fall apart, and the pilot will proceed to the lunar surface unaided!

Assuming that you can avoid all these pitfalls, you still have to ensure that your landing speed is sufficiently low, because even though moon gravity is approximately one fifth of earth gravity, your inertia is still the same. In fact, to achieve a good landing, you need to have a terminal velocity of less than 1 metre per second, or about 2.2mph.

In fact, the only good point about this simulation is that it is not in real time, and you have lots of time to think between moves. A typical landing will take about 50 seconds of simulator time, and about 10 minutes real time.

Fig. 1 is a listing of the program. You will need about 2K of RAM to run it, apart from the 5K required by the TCT BASIC. Putting it another way, you will need to have page 0 full of RAM, apart from the 1K occupied by PIPBUG.

Load it in exactly as per the listing, remembering that the punctuation forms part of the program, and should not be changed. To start the program, simply type RUN. After the program name and trumpet blowing section, it will give you a small list showing initial height, velocity, time and fuel stocks. Velocity is measured positive downwards, i.e., towards the lunar surface.

The program will then expect you to type in a fuel rate in kg/s, followed by a duration in seconds. This is how you specify to the program what propulsive

```
0005 PR"":PR"LUNAR LANDER":PR"BY D.W.EDWARDS 3/9/78"
0010 FIX 2:T=0:V=-25:E=200:G=2:H=1000:M=10000
0015 GOSUB 100:IF R<500 GOTO 25
0020 PR"":PR"FUEL RATE TOO HIGH!":PR"MOTOR BURNS OUT":GOTO 50
0025 GOSUB 200:IF A<13 GOTO 35
0030 PR"":PR"G FORCES TOO HIGH!":PR"LANDER BREAKS UP":GOTO 75
0035 IF M<=5000 GOTO 45
0036 N=N-1:IF H<=0 GOTO 57
0040 IF N<=0 GOTO 15
0041 GOTO 25
0045 PR"":PR"NO FUEL LEFT!"
0050 PR"PREPARE FOR LANDING":R=0
0055 GOSUB 200
0056 IF H>0 GOTO 55
0057 IF V>=0 V=-V
0060 PR"":PR"TOUCHDOWN AT",T,"S":PR"TERMINAL SPEED =",-V,"M/S"
0065 IF V>-1 GOTO 85
0066 IF V>-5 GOTO 90
0067 IF V>-10 GOTO 95
0070 PR"":PR"A NEW LUNAR CRATER",M*V*V/50000,"M"
0071 PR"DEEP WILL BE DISCOVERED SOON!"
0075 PR"":PR"DO YOU WANT TO PLAY AGAIN";
0076 INPUT ?$1:$2="NO":$3="YES"
0080 IF $1=$2 STOP
0081 IF $1=$3 GOTO 10
0082 GOTO 75
0085 PR"GOOD LANDING":GOTO 75
0090 PR"ROUGH LANDING":GOTO 75
0095 PR"LANDER DESTROYED":GOTO 75
0100 PR"":PR"HEIGHT =",H,"M":PR"SPEED =",-V,"M/S"
0105 PR"FUEL LEFT =",M-5000,"KG":PR"TIME =",T,"S"
0110 PR"FUEL RATE (KG/S) ";
0111 INPUT=R:IF R>=0 GOTO 115
0112 GOSUB 120:GOTO 110
0115 PR"DURATION (S) ";
0116 INPUT =N:N=INT(N):IF N>0 GOTO 118
0117 GOSUB 120:GOTO 115
0118 RETURN
0120 PR"IMPOSSIBLE - TRY AGAIN":RETURN
0200 M=M-R:A=E*R/M-G:T=T+1:H=H+V+A/2:V=V+A:RETURN
```

FIG. 1

This listing of the Lunar Lander was written in TCT BASIC, but is adaptable to other types of BASIC.

```
LUNAR LANDER
BY D.W.EDWARDS 3/9/78

HEIGHT = 1000.00 M
SPEED = 25.00 M/S
FUEL LEFT = 5000.00 KG
TIME = 0.00 S
FUEL RATE (KG/S) =600
DURATION (S) =3

FUEL RATE TOO HIGH!
MOTOR BURNS OUT
PREPARE FOR LANDING

TOUCHDOWN AT 22.00 S
TERMINAL SPEED = 69.00 M/S

A NEW LUNAR CRATER 952.20 M
DEEP WILL BE DISCOVERED SOON!

DO YOU WANT TO PLAY AGAIN?YES

HEIGHT = 1000.00 M
SPEED = 25.00 M/S
FUEL LEFT = 5000.00 KG
TIME = 0.00 S
FUEL RATE (KG/S) =480
DURATION (S) =10

G FORCES TOO HIGH!
LANDER BREAKS UP

DO YOU WANT TO PLAY AGAIN?YES

HEIGHT = 1000.00 M
SPEED = 25.00 M/S
FUEL LEFT = 5000.00 KG
TIME = 0.00 S
FUEL RATE (KG/S) =200
DURATION (S) =20

HEIGHT = 1046.44 M
SPEED =-38.51 M/S
FUEL LEFT = 1000.00 KG
TIME = 20.00 S
FUEL RATE (KG/S) =0
DURATION (S) =100

TOUCHDOWN AT 77.00 S
TERMINAL SPEED = 75.48 M/S

A NEW LUNAR CRATER 683.84 M
DEEP WILL BE DISCOVERED SOON!
```

FIG. 2

Illustrated above is a printout showing how the program reacts to a variety of "wrong" inputs.

force you require, and for how long. The program will then calculate your new height and velocity, and present these, along with the elapsed time and amount of fuel remaining.

All you have to do then is supply the appropriate numbers, till the program terminates. Note that only positive fuel rates and times are accepted, and that the program turns all times into integer numbers.

Fig. 2 shows some sample printouts of typical games. Note that all outputs have less than 32 characters per line, although the program listing does not. If you are using the Low Cost VDU (February and April 1977), the automatic carriage-return line-feed facility will let you see all of the listing as you feed it in.

If you let your family and friends play this game, be warned. It is very engrossing, and you may have trouble getting them away from it!

Discount Components

SPECIALS

10 RED LEDS	$1.50	100 RED LEDS	$13.00	10 μA301	$3.30
7805	90c	10 4016	$4.50	4N28	$1.00
7812	90c	6 LUG TAG STRIPS	5c	4N29	$1.10
LM317K	$2.90	309K	$1.50	10 7490	$3.00
TIL209	18c			10 74123	$5.00
10 BC547	$1.20	10 GREEN LEDS	$2.90	10 741	$2.90
		10 YELLOW LEDS	$2.90	LED CLIPS	2c
IN4003	7c	10 4011	$2.00	10 723	$4.50
IN4002	7c	10 74LS00	$2.00	2114's	$7.50 each

LINEARS		BC338	25	74150	1 60	74LS190	2 80
301	40	BF115	85	74151	1 10	74LS191	1 20
307	65	BF180	75	74153	1 10	74LS192	1 20
308	1 25	PN3643	25	74154	1 70	74LS193	1 20
309K	1 90	PN3645	25	74157	1 10	74LS194	1 20
311	80	**BRIDGES**		74160	1 55	74LS195	1 20
317K	2 90	MDA3501 35A		74161	1 75	74LS196	1 20
318	3 25	100V	4 10	74164	1 55	74LS197	1 90
324	1 25	MDA3502 35A		74165	1 55	74LS221	1 90
325	4 60	200V	4 20	74173	2 75	74LS253	1 85
339	85	MDA3504 35A		74175	1 65	74LS279	65
348	1 60	400V	4 50	74180	1 35	74LS365	75
349	2 25	W04 1.5A		74192	1 40	74LS366	90
356	1 65	400V	80	74193	1 40	74LS367	75
377	2 75	**SCR**		74197	1 50	74LS368	75
379S	6 95	C103YY	8A	74221	1 50	74LS386	95
380 14 Pin	1 30	60V	80	74251	1 50		
381	1 95	C106A1	4A	74367	1 20	**CMOS**	
382	1 95	100V	95	74368	1 20	4000	40
387	1 90	C106D1	4A			4001	25
386	1 90	400V	1 30	**74LS**		4002	25
555	35	C122D1	8A	74LS00	25	4006	1 40
556	85	400V	2 50	74LS01	30	4007	25
565	1 90	C122E	8A	74LS02	25	4008	1 25
566	2 40	500V	2 60	74LS03	30	4010	1 25
567	2 60	**I.C. SOCKETS**		74LS04	35	4011	25
709	70	8 PIN	25	74LS05	35	4012	25
723 (VR)	50	14 PIN	33	74LS08	30	4013	55
741	30	16 PIN	35	74LS09	30	4014	1 30
747	90	18 PIN	50	74LS10	25	4015	1 20
3900	85	20 PIN	60	74LS11	30	4016	50
3909	1 20	22 PIN	75	74LS12	30	4017	1 30
CA3028	2 90	24 PIN	80	74LS14	1 00	4018	1 40
CA3046	2 10	28 PIN	90			4019	75
CA3130	1 95	40 PIN	1 00	74LS15	35	4020	1 55
CA3140	1 95	**TTL**		74LS20	30	4021	1 35
RL4136	2 90	7400	25	74LS21	30	4022	1 60
REGULATORS		7401	25	74LS22	35	4023	25
7805	1.00	7402	25	74LS26	40	4024	90
7806	1 20	7403	25	74LS27	30	4025	40
7808	1 20	7404	35	74LS28	40	4026	2 10
7812	1 00	7405	35	74LS30	30	4027	80
7815	1 20	7406	50	74LS32	30	4028	1 25
7818	1 20	7407	50	74LS37	45	4029	1 85
7824	1 20	7408	32	74LS38	45	4030	40
7905	1 50	7409	32	74LS40	30	4040	1 30
7906	1 50	7410	25	74LS42	1 10	4041	1 25
7908	1 50	7411	35	74LS47	1 40	4042	1 25
7924	1 50	7413	55	74LS48	1 50	4043	1 59
7912	1 50	7414	90	74LS49	1 80	4044	1 50
7915	1 50	7416	60	74LS51	45	4046	1 80
78L05	40	7417	60	74LS54	45	4049	60
78L12	40	7420	25	74LS55	45	4050	60
78HGKC	8 50	7421	50	74LS73	90	4051	1 20
78H05	7 90	7422	30	74LS74	50	4052	1 20
78H12	7 90	7426	45	74LS75	70	4053	1 20
723	50	7417	45	74LS76	95	4060	2 60
309K	1 90	7430	30	74LS78	50	4066	1 00
317K	2 90	7432	40	74LS83	1 50	4068	40
OPTO		7437	50	74LS85	1 50	4069	35
FND357 C C	1 30	7438	50	74LS86	50	4070	40
FND500 C C	1 25	7440	30	74LS90	1 10	4071	40
FND507 C A	1 40	7441	1 50	74LS92	1 20	4072	40
FND800 C C	3 50	7442	70	74LS93	1 10	4073	40
TIL209 Leds	20	7447	95	74LS95	1 50	4074	40
RED LEDS	18	7448	95	74LS107	1 20	4076	1 85
100 for	13 00	7450	35	74LS109	50	4077	40
YELLOW	30	7451	35	74LS112	1 20	4078	40
GREEN	30	7453	35	74LS113	55	4081	40
Mounting Clips	3	7454	30	74LS114	55	4082	40
DIODES		7460	35	74LS122	2 00	4510	1 40
1N4148	5	7470	65	74LS123	1 90	4511	1 40
100 for	4 00	7472	45	74LS125	1 90	4518	1 50
1N4002	7	7473	60	74LS126	1 50	4519	95
1N4003	8	7474	65	74LS132	1 60	4520	1 45
1N4004	9	7475	65	74LS126	79	4528	1 20
100 for	7 00	7476	45	74LS138	1 20	14553	7 30
1N5625	50	7480	1 25	74LS139	1 90	14584	1 25
RESISTORS		7483	1 25	74LS151	1 20	74C00	40
½ Watt I.R.H. metal Glaze 1 ohm to 1M (E24 Values). $1.99	3	7485	1 45	74LS153	1 90	74C02	40
100-999	2.5	7486	65	74LS154	1 60	74C04	40
TRANSISTORS		7489	1 90	74LS157	1 00	74C08	40
BC547/8/9	15	7490	50	74LS158	1 90	74C10	40
BC557/8/9	20	7491	1 00	73LS160	2 20	74C14	1 75
BD139	55	7492	65	74LS161	2 20	74C48	2 40
BD140	55	7493	65	74LS162	2 30	74C73	1 20
2N3055	85	7494	1 10	74LS163	1 20	74C75	1 20
MJ2955	95	7495	95	74LS164	1 30	74C76	1 35
BC337	25	74100	2 24	74LS168	3 30	74C90	2 20
		74107	65	74LS169	3 50	74C93	2 20
		74121	50	74LS170	3 50	74C175	1 85
		74123	90	74LS173	2 10	74C192	2 20
		74132	1 25	74LS174	1 00	74C193	2 20
				74LS175	1 00	74C221	2 20

Minimum pack and post $1.00 please stipulate if any items are out of stock that a credit be issued or the items to be backordered or an immediate refund be issued.
Send 40c stamp for copy of free condensed catalogue.
Open from MON THURS 8.00am – 5.30pm
FRI 8.00am – 7.00pm SAT 8.30am – 12.30pm

ALL GOODS ARE PRIME SPEC FROM LEADING MANUFACTURERS

MAIL ORDERS TO: P.O. BOX 135 NORTHCOTE, VIC. 3070
PERSONAL SHOPPING AT THE SHOP AT 499 HIGH ST NORTHCOTE, VIC. 3070.

ROD IRVING ELECTRONICS

A "Micro BASIC" for small 2650 systems

If you have a 2650 microcomputer with only PIPBUG and 4K bytes of RAM, you probably think it's too small to run even a cut-down version of BASIC. Well, not any more — you can now get an interpreter called "Micro BASIC" which will run in systems this small. Editor Jim Rowe reviews Micro BASIC in this article.

Not long ago, I received a 'phone call from a reader, Mr Alan Peek of Woolwich NSW, who told me that he had successfully written a "micro BASIC" interpreter for very small 2650 systems. As he was proposing to offer it for sale to readers, would I be interested in trying it out and perhaps publishing a short review?

It sounded interesting, so I asked for a few more details. He explained that he had written the interpreter to run in systems with as little as 4K of RAM, to allow those with such systems to be able to program them rapidly and easily for useful tasks. He had managed to squeeze the interpreter itself into a mere 1.6K bytes of memory, by using single-character commands, reverse Polish notation, and an efficient way of packing the source program into memory.

At my invitation Mr Peek sent a cassette of his interpreter to me a few days later, along with a copy of the literature he is supplying with it. Since then I have been able to spend some time using it and discovering its capabilities.

For convenience the program is best visualised as divided into two sections: the interpreter proper, which translates and executes the source program in "run" mode, and a text editor which is used for feeding in, modifying and listing the source program.

The text editor has similar functions to those found in other interpreters, although they are used a little differently because of the different way that this editor packs the source statements into the RAM buffer. Unlike other interpreters, this one does not accept line numbers from the programmer — it supplies its own, which are attached to lines in simple incrementing order.

Doesn't this make it hard to insert extra lines, when you need to? No, you can use the editor functions to insert or delete lines as required. All that happens is that when you do this Micro BASIC simply re-numbers all of the lines.

It takes a little while to get used to this if you have been using a more conventional BASIC interpreter, but once you do it is just as convenient as the conventional approach.

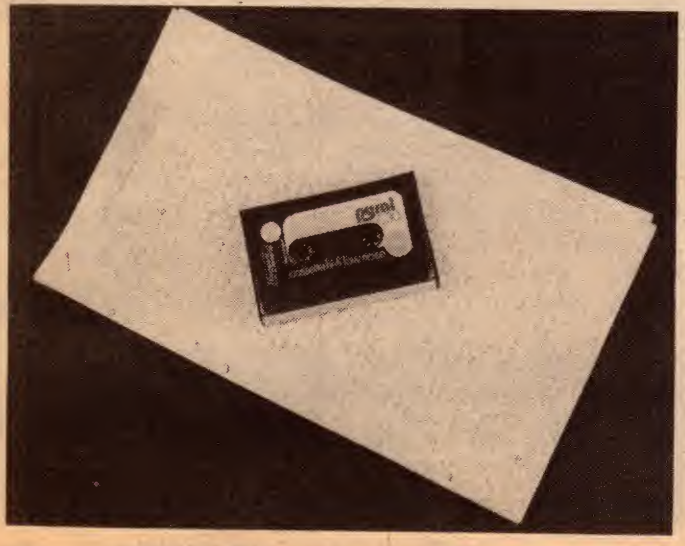
As far as the interpreter itself and its operation are concerned, probably the most obvious differences from conventional BASIC and Tiny BASIC interpreters are the use of single-character statements and reverse Polish notation. But again these don't really take long to get used to, and many people prefer reverse Polish notation — as witnessed by the popularity of calculators which use it. Many people also like the ability to shorten BASIC statements to single characters, because it lets them pack in larger programs!

There are a few differences from normal BASIC in the actual statements, but not of a major nature. Instead of the familiar IF . . . THEN statement, Micro BASIC has a "TEST" statement, but this functions in a similar fashion. Similarly string input and output statements ("A" and "O") and a "Memory (M)" statement which performs similar functions to the conventional PEEK and POKE.

Micro BASIC has a random number function, although this works in a fairly unorthodox fashion. When this function is reached during program execution, a "!" is printed out on the terminal and the operator is expected to press any key. The time delay before a key is pressed is used to generate a random number. Rather unusual, but then so are some other random number functions!

Two statements offered by Micro BASIC which are not found on many small BASIC interpreters are a variable increment and decrement. It also has a CALL statement, and the ability to have multiple statements on a line. Unlike most other BASICs you can also have comments anywhere on a line, even between statements.

A sample of a small program written in Micro BASIC is shown here so that



```
L1
1 P"MICRO BASIC NUMBER GUESSING GAME"
2 P P"WHAT WILL BE OUR UPPER LIMIT " IA P
3 P"NOW PRESS A KEY" LA!!+=R,Ø=T $T= COUNT OF TRIES$
4 P"RIGHT.HERE WE GO!"
5 P"GUESS= " IG LT1+=T $INCREMENT COUNT$
6 TG>R P"TOO BIG" G5
7 TG<R P"TOO SMALL" G5
8 P"YOU GOT IT IN",T,"TRIES"
9 P"WANT TO PLAY AGAIN? 1=YES,Ø=NO" IB
10 TB=1 G3
11 P"BYE" $MUST HAVE BEEN NO$
12 E
13
>
```

LEFT: Micro BASIC comes as a cassette with accompanying literature. The early notes shown were handwritten, but those now supplied are typed. ABOVE: A sample program, written in Alan Peek's Micro BASIC.

```
G1
MICRO BASIC NUMBER GUESSING GAME

WHAT WILL BE OUR UPPER LIMIT ?100

NOW PRESS A KEY!*
RIGHT.HERE WE GO!
GUESS= ?50
TOO SMALL
GUESS= ?75
TOO BIG
GUESS= ?67
TOO SMALL
GUESS= ?71
TOO BIG
GUESS= ?69
TOO SMALL
GUESS= ?70
YOU GOT IT IN 6 TRIES
WANT TO PLAY AGAIN? 1=YES,0=NO?0
BYE
>
```

How the sample Micro BASIC program looks when running on a small 2650 system.

you can see how it looks. Note the comments, identified by dollar signs at each end. Also the input statements, represented by "I" characters, and the test statements ("T"). A listing is also given showing the same program when running.

The literature which comes with Micro BASIC includes a full source listing. This is all hand written, but includes plentiful comments. Alan Peek explains that he is happy for users to understand how the interpreter works, and to make mods and improvements if they wish. A generous attitude, to be sure.

The explanatory material supplied is quite helpful and easy to follow, although those with hawk eyes will be able to spot quite a few spelling errors. I did, but then that's part of my job! Despite this I think most people will find it tells them all they need to know about Micro BASIC.

In short, Alan Peek's BASIC seems a very practical piece of software, well suited for small 2650 systems despite a few unorthodox features. It seems good value for money at $8.50 for a cassette with instructions and source listing, including postage.

You can get it from Alan Peek by writing to him at 10 Gale Street, Woolwich NSW 2110.

EUY10E Mosaic Printer

The prices referred to in the Philips Mosaic Printer advertisement in the December 1978 issue, on page 99 were incorrect due to fluctuations in the exchange rate of Japanese currency. The correct prices are available on application to Philips Electronics Components and Materials.

MELBOURNE'S BYTE SHOP

MELBOURNE: 17 ARAWATTA ST., CARNEGIE 3163.
PHONE: (03) 568-4022

SYSTEMS	Z80, 8080, and 6800 based.
MEMORY	RAM — 8, 16 & 32K ROM — 4, 8, 16 & 32 utilizing 2708 or 2716.
INPUT/ OUTPUT	5" mini floppy, 8" Persci dual floppy, 8" IBM compatible floppy; cassette; VDUs; Keyboards; paper tape readers: printers; monitor.
SPECIAL PURPOSE	Prototyping boards; digital to analog converters, data acquisition, PROM programmer, speech recognition, speech synthesizer, music synthesizer, interfaces built to your requirement.
HARDWARE	Transformers (suited to S100 bus supply), bridge rectifiers, low profile IC sockets, special components, S100 sockets and guides.
SOFTWARE	BASICS, FORTRAN IV and COBOL, Macro Assembler, Assembler/Disassembler, Disc operating systems, Word processors, Inventory, Data Base Management.
KILOBAUD	U.S. magazine — understandable for beginners, interesting for experts. New readers only send $3.00 for a copy now.

Send $1.00 for quarterly newsletter per annum charge, and $5.00 for quarterly product and price updates.

MELBOURNE'S BYTE SHOP, P.O. BOX 156, CARNEGIE, VIC 3163

YOU WILL STRIKE IT LUCKY AT

LOOKY VIDEO

Computer Gold Rush

Ohio Scientific Computers from $367 & VDU monitors from $199 Stake your claim with 20% deposit

WIDE RANGE OF VIDEO EQUIPMENT

Fairchild programmable TV Games only	$199.00
& Cartridges at	$19.95 (each)
VHS Recorders	$1095
U-MATIC: Reel to reel recorders, etc.	
Trade-ins and demo models cheap	
National Giant TV	$5498

AMATEUR AND VIDEO

TV cameras b/w from $269.00, colour from $1300.00
COMMUNICATIONS RECEIVER DR48 $469.00
ALSO AVAILABLE A RANGE OF EDUCTIONAL AND FUN GAMES

T.I. CALCULATORS, SOLAR ELECTRICITY
G.E. BATTERIES & CHARGERS

Dubbing and editing from $10 per hour.

CASH — CARDS — TERMS — LEASING

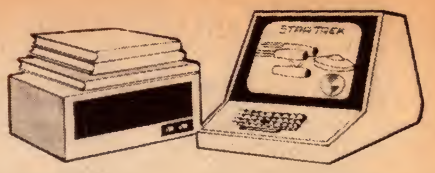
For further details contact:

Bruce Fisher VK3 YRF/A.T.V. at:

LOOKY VIDEO
418 Bridge Rd, Richmond, Vic. 3121
(03) 429 5674

All mail to: PO Box 347, Richmond, Vic. 3121.

Microcomputer News & Products



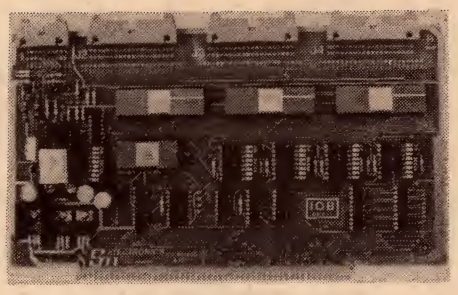
S100 I/O board

A new input/output (I/O) board for S100 bus-orientated systems has been released by SM Electronics. The board features nine 8-bit parallel I/O ports using 8255 PPI devices, together with a single serial I/O port using an 8251 programmable USART. The serial port will interface to either 20mA current loop or TTL-level circuitry, and provides a selection of crystal-locked communication rates up to 9600 baud.

All devices on the board are fully decoded for tight address mapping, and all data and address lines are fully buffered with three-state LS chips. The PCB is of high quality fibreglass with through-hole plating and solder mask. The external I/O connections are via four flat ribbon connectors (supplied), individually linked for flexibility.

The I/O board is available as either a kit or fully assembled and tested. Prices are $164.00 and $189.00 respectively, plus tax if applicable.

SM Electronics also has mother boards and card cages for both S100 and 6800 systems. S100 mother boards are available in both 8-slot and 11-slot versions, both with ground plane on top. Prices are $22.50 and $33.00 respectively, plus tax.



Further information from SM Electronics at 10 Stafford Court, Doncaster East, Victoria 3109.

Education conference

The Computer Education Group of Victoria is calling a national conference on the uses of computers in education, to be called "Students, Teachers and Computers". The conference will be held on May 17 and 18 at Latrobe University, Melbourne, Vic.

CEGV stresses that it does not want the conference to be dominated by Victorians, and invites anyone interested in the educational uses of computers to attend — primary and secondary school teachers in particular.

Further information on the conference is available from Norbert Nimmervol, Secretary of CEGV, Educational Technology Unit, Victorian Institute of Colleges, 582 St Kilda Road, Melbourne, Vic. 3004.

Sorcerer Users' Club

A club for users of the Exidy "Sorcerer" microcomputer has been started in Victoria. Known as the Sorcerer Users' Club, the organisation plans to be in close contact with Dick Smith Electronics, importers of the Sorcerer, and to keep members well informed of new additions in both the hardware and software areas.

ASP ?

ASP is the superb ASP SYSTEM ONE Computer for business, scientific or educational use. Problem solving at a very reasonable price.

ASP is a professional quality conversion of the IBM SELECTRIC typewriter to a word processing quality printer with either S100 or RS232 interfaces.

ASP is the magnificent MALIBU DESIGN GROUP printer. 160 cps bi-directional and graphics capability with the looks of a high quality piece of furniture.

ASP is the new ASP Computer Portrait System - a profitable small business that can be transported in your vehicle.

ASP MICROCOMPUTERS

DEAR ALI - please rush me brochures on:
EVERYTHING!
ASP SYSTEM ONE
SELECTRICS
MALIBU
COMPUTER PORTRAITS
DEALERSHIPS!

SELECTRIC is a Trademark of IBM

ASP is ALI!

NOTE OUR NEW ADDRESS:
799 DANDENONG ROAD EAST MALVERN 3145
& OUR NEW TELEPHONE NUMBERS:
211 8855 211 8344

Membership is open to both experienced and inexperienced users of any age.

Further information is available from Frank Schuffelen, 66 Porter Street, Templestowe, Victoria 3106.

Sydney computer show

Australian Seminar Services, organisers of last year's successful Home Computer Show in Melbourne, have announced that they are organising a similar Show in Sydney this year. The show will be held in the lower hall at Sydney Town Hall, right in the centre of the city, from May 17th to 20th inclusive.

Bookings from exhibitors are now being accepted. Further information from Australian Seminar Services Pty Ltd, 10th Floor, 14 Queens Road, Melbourne, Victoria 3004 (telephone 03-267 4311), or Box 1901, GPO Sydney 2001.

Low cost printer

A new low cost 80-column line printer has been released in Australia by Bell & Howell. Known as the Anadex DP8000, the printer is a self-contained unit well suited for use with mini and microcomputers as either part of a terminal or as a stand alone printer. It has a 96-character ASCII set, using a 9 x 7 dot matrix.

The printer has three input options: RS232C, 20/60mA current loop or 8-bit parallel format which is Centronics plug compatible. It features bidirectional printing, giving 84 lines per minute (112cps) throughout at 9600 baud, a standard FIFO buffer store of 3 data lines (256 chars), and an optional 2048 character buffer for CRT dump and similar applications.

The printer uses fan-fold paper 254mm wide and employs sprocket feed. The print head is capable of printing an original plus 3 copies, and is rated for 100 million characters life. Other features include single or double width character printing, an "out of paper" detector, top of form programming and "skip over perforation" control. One-off price of the DP8000 is $1099.00.

The printers are available either from Bell & Howell Australia or from its newly appointed distributors for Anadex printers, EAI-Electronic Associates Pty Ltd and Computerland Australia.

Z-80 card family

Zilog Inc. has announced a series of Z-80 microcomputer boards, designed to provide a modular approach to the assembly of complete systems. Heart of the series is the Z80-MCB single board computer, which comes with 4K bytes of dynamic RAM, capacity for up to 4K bytes of ROM or PROM and either 1K or 3K monitor firmware, duplex serial I/O port, two 8-bit parallel I/O ports and full buffering for expansion.

Other boards in the series include a memory/disk controller board, the Z80-MDC, a 16K/64K dynamic RAM board with provision for eight ROM/PROM devices as well (Z80-RMB), a 32K ROM/PROM board (Z80-PPB), a video display board (Z80-VDB), a parallel I/O board with 64 lines (Z80-IOB), and a variety of analog I/O boards.

To go with the boards Zilog has a matching card cage, wire-wrap applications cards, and edge connectors and extender cards for the 122-way connectors used on the various boards.

Further information is available from Zilog distributors Zap Systems Pty Ltd, 3 Smail Street, Broadway, NSW 2007.

Motorola distributor

Rank Industries Australia has been appointed national distributor for Motorola microsystems, memory systems and software packages. Rank will provide sales and service of standard systems, and also develop complete working installations. Further information is available from Gordon Richmond in Melbourne on 29 3724, or Robert Cunningham in Sydney, 406 6176.

INFORMATIVE SYSTEMS

Specialists in professional microcomputers and high performance computer support peripherals. Including:-

Cromemco	—	Z80A 7 languages, colour graphics and more coming.
Altos	—	Z80A compact, reliable. CPM.
Diskette Business Machine	—	powerful, dedicated business computer and word processor.
Datamaster & Datamate	—	intelligent diskette data storage.
Centronics printers	—	complete range.
ADDS video terminals	—	complete range.
TRS-80 peripherals and software.		
SERIAL INTERFACE	—	$75 add-on discs $489
CENTRONICS 779	—	tractor feed, for TRS-80 $1699
CENTRONICS 779	—	friction feed for TRS-80 $1599

Add 15% sales tax if applicable.

Paper diskettes and cables in stock.

3 BANK STREET, SOUTH MELBOURNE, VICTORIA, AUSTRALIA, 3205.
TELEPHONE (03) 690 2284 TELEX AA 30458. INSYST.

EXPAND YOUR M6800 D2 KIT

OR OTHER MICROCOMPUTER With

PP

Motorola Exorcisor Compatible Modules

	Kit	Ass. & T.
16K STATIC RAM CARD Using 2114L		
● 4K (450nS low power)	$176.18	$206.77
● 8K (450nS low power)	$238.20	$277.55
● 16K (450nS low power)	$359.49	$413.65
● 4K (300nS low power)	$185.38	$215.97
● 8K (300nS low power)	$256.68	$295.95
● 16K (300nS low power)	$396.29	$450.45
16K PROM CARD WITH ON-BOARD PROGRAMMER		
For Single Supply 2716		
● Ass & tested with Low Insertion Force Sockets		$226.90
● Ass & tested with Zero Insertion Force Sockets		$271.63
● D2 Kit Driver Program (listing + instructions)		$11.50
● 2716 PROMs each		$55.90
2708 PROM PROGRAMMER		
● Ass & tested		$149.70
● D2 Kit Driver Program (listing + instructions)		$11.50
● D2 Kit Driver Program in 2708		$27.60
● Driver Program for VDU type monitor (listing + instructions)		$11.50
24 PIN PROM SOCKETS		
● Low Insertion Force each		$5.35
● Textool Zero Insertion Force Socket each		$10.90
PROTOTYPING BOARD		
● Plated through with earth plane		$43.20
16K RAM/PROM Using 2102As & 2708s		
● 16K Memory Mother Board Kit		$41.85
● 4K RAM PLANE Kit (450nS)		$68.50
● 4K ROM PLANE Kit (2708s extra)		$24.90
● RAM or ROM PLANE PCB only		$14.80
● Set of sockets for stacking RAM/ROM PLANE on Mother Board (included with Kits but not PCBs)		$2.85
CDB-150 FAST AUDIO CASSETTE INTERFACE		
● In case (Software Driver included)		$199.00
D2 BUFFER ICs		
● 2 x 8T26, 3 x 8T97, 1 x 7430		$13.80
BACKPLANES & EDGE CONNECTORS		
● 5 slot Backplane (has earth plane)		$27.60
● 11 slot Backplane (has earth plane)		$35.90
● Edge Connectors (PCB mounting or solder eye) each		$8.50
or 5 for $39.75 or 11 for		$84.70
CARDCAGE WITH 11 SLOT BACKPLANE		
● Includes all metal work and guides, etc		$190.90

For Data Sheets Send Stamped SAE.
All Prices include Sales Tax.
Add P&P: $1.00 — cost under $50, $2.00 — cost $50 to $150, $3.00 — cost over $150.

Products Designed & Manufactured in Australia by

PP **Pennywise Peripherals**

19 Suemar Street, Mulgrave Vic 3170, (03) 546 0308

Classical Recordings

Reviewed by Julian Russell

Puccini — The Girl of the Golden West: "vivid production"

PUCCINI — The Girl of the Golden West. Complete Opera. Carrol Neblett (Minnie); Sherrill Milnes (Rance); Placido Domingo (Johnson) and many others with the Chorus and Orchestra of the Royal Opera House, Covent Garden. Conducted by Zubin Mehta. DGG Stereo 2740 186. (Three Records).

Puccini's Madame Butterfly was a flop when first produced in 1904. So was his Girl of the Golden West six years later — a real universal "bellyflop". Madame Butterfly recovered to become a robust success. But not "The Girl". It remained despised and rejected on the grounds of its banal story, the mostly Italian performers trying ludicrously to look and act like Western miners and cowboys — they look just as odd wearing the kilt in Lucia di Lammermuir — the inclusion of phony-sounding cakewalks, and the awful banality of its "famous" waltz tune. But nowadays it is being treated less harshly as many have discovered the richness of its harmonies, the ingenuity of its orchestration and its interesting seeds of Turandot.

Here is a personal example of how it was regarded in the early 1920s. I was working for J. C. Williamson at the time and lent a copy of the vocal score to their influential musical director-in-chief, the late Andrew MacCunn. The "Firm" was then at the height of its long prosperity, running sometimes as many as five or six different musicals at their various theatres. MacCunn returned it after only one or two days and when I asked him why he hadn't kept it longer he said: "I'd hate to die suddenly and have it found among my personal effects."

But nowadays, while it cannot even now be classed as a roaring success, it has its enthusiastic admirers, though many others still only tolerate an occasional performance.

The excellence of the production under review might even increase its acceptance among the latter. Much of the credit for this must go to the conductor, Zubin Mehta. He takes most of it very briskly, avoids sentimentalising its melodramatic love story, spaces its climaxes to achieve their best effects and generally plays it as if he likes it. His efforts are rewarded by the superb playing of the Covent Garden Orchestra and the excellent singing of most of the cast, above all by Carrol Neblett in the title role. Hers is a most difficult part, vocally and dramatically, calling for immense reserves of power, a wide range including some high notes that must be attacked with unfailing accuracy, and the ability to make Minnie a warm, sympathetic character. Neblett combines all these talents in a convincing portrayal that goes far to overcome some of the not-so-impressive reaches of the score.

Another outstanding performance comes from Sherrill Milnes as the "villain", sheriff Rance. He, too, makes his reading entirely believable, his motives not entirely bad, even at times noble — a far cry from the blackhearted merciless fellow of previous casts. Placido Domingo, as the hero, is entirely acceptable, ardent enough to impress even the toughest western tavern-keeping wench, who is adored and protected by even the most brutal of her customers.

The score has, of course, some fine Puccini melodies to counter some of the weaker spots. But the waltz tune still sounds as awful as ever, like a feeble exercise in composition by a not very bright student. Some claim that it grows on one after repetition though I am not of that number. But don't let any of my disparaging remarks deter you from missing a vivid production.

DIRECT TO DISC

VOCAL RECITAL — Michael Li-Paz (bass) and Zoltan Rozsnyai (piano). Direct to disc recording distributed by M.R. Acoustics, PO Box 110, Albion, Brisbane, 4010.

In the February issue of "EA", Neville Williams discussed a "new" process of recording music direct-to-disc. I put "new" in quotes because until after World War 2 all records were made by recording direct to 78rpm disc masters, which never exceeded more than about four minutes playing time.

The traditional approach since then has been to first make the recording on tape and then transfer this, through a number of processes, onto disc. This is one of the reasons why "direct cut" discs have found so much recent popularity. In a direct cut disc, the signal is fed direct to the disc cutter, without the intrusion of tapes and dubbings.

Both systems have their advantages and disadvantages, of course, and the direct-to-disc handicaps were made very clear by Neville Williams in his article. To refresh your minds on what Neville Williams wrote, I quote him briefly:

"Direct cut discs pose many problems: the "strain" on the performers; the inability of engineers to "rehearse" the cut; the risk of repeated failures; the lack of variable pitch facility; the inability to cut at half speed; the limited production run and the resulting price ($19) disadvantage. And so on."

I endorse every one of these points with special emphasis on the dire results which might crop up when recording big orchestral or operatic works. A slight blemish could easily be adjusted on a tape, but the new process would mean recording the whole disc again, from start to finish, with crossed fingers in case something else goes wrong, either in the same place or elsewhere. The problems encountered in recording a big movement such as the Finale of Beethoven's Ninth Symphony or the Triumph scene in Verdi's Aida, both of which call for vast congregations of performers, are too perilous to contemplate. What might pass very quickly at an ephemeral live performance would become tiresomely conspicuous on repeated playing of the record.

While these remarks apply to the direct cut approach as such, the development of digital recording technology holds firm promises of a way around the difficulties. As explained in the February issue, digital recording offers all the conveniences of tape mastering, without a significant retreat from the potential quality of direct cut.

The disc sent to me for review is of a vocal performance. I would have preferred an orchestral one, which would have required much more supervision of the engineering than a recording of a simple voice with piano accompaniment. The more performers, the greater the risk of something going wrong, a large performance requiring a much wider spectrum of colour, dynamics and accuracy.

True the vocal sample sent to me is outstanding in its fidelity and dynamic range — in fact, the dynamic range is a little too wide for comfortable listening in the average room. But neither of the performers is out of the top drawer, probably owing to the fact that all the best artists — and this means the best sellers — are, with very few exceptions, under contract to the major recording companies (HMV, CBS, RCA and so on). However, Michael Li-Paz sings with taste in a good, but not outstanding, voice recorded with quite wonderful presence. What's more the accompanist plays beautifully and is admirably balanced against the singer.

As this review is already growing much longer than I originally intended I have not the space to mention all the merits — and otherwise — of Li-Paz, except for saying that he is well worth listening to.

☆ ☆ ☆

JESSYE NORMAN — Recital of French Songs. 4 by Duparc, 2 by Ravel, 4 by Poulenc, and 4 by Satie. Philips Stereo Disc 9500 356.

I was so entranced by the sheer glory of Jessye Norman's voice, her exquisite phrasing, and her changes of mood and style to suit the various composers, that I was a little puzzled after the record was finished to find myself slightly disappointed in the recital. It was only repetition that enabled me to delve beneath my sensuous enjoyment of the sound, and remember performances of some of the songs by other artists.

What I did notice was Norman's slightest possible lack in stressing the meaning of what she was singing. Such a discovery is difficult to make, so hypnotised is one by the sheer beauty of her voice. But sometimes — and not rarely — the point of the song is so subtly expressed by the beautifully sensitive French composers that it can easily be overlooked by the singer. This happens here and there in this otherwise gorgeous recital, although less quibbling listeners will find themselves enchanted by just listening to the voice. Jessye Norman's voice is unequalled by all those other singers, even those that do make that tiny difference in interpretation. Even the most enthusiastic lovers of the songs might easily miss her occasional lapses.

These songs by Jessye Norman have been skillfully chosen to show up the many peerless qualities of her voice, and Dalton Baldwin accompanies competently.

LISZT — Piano Recitals
WAGNER TRANSCRIPTIONS

LISZT — Piano Recital. Les Funerailles. Mephisto Waltz No. 1 Valse Impromptu. Prelude and Fugue on the name B-A-C-H. The Fountains at the Villa D'Este. Michael Campanella (piano). Nix Mono Disc SPLP 1532.
WAGNER TRANSCRIPTIONS. Tannhauser Overture. Parsiful Act 1 Transformation Music. Wallhalla. Spinning Song from the Flying Dutchman. Lohengrin. Tristan and Isolda (Isolda's Love Song).

Campanella, who toured Australia last year, has all the necessary formidable technique, but never flaunts the virtuoso side of it. He seems to just take it for granted while still preserving true Liszt panache. He introduces plenty of changes of sonorities and moods always in the right places. For instance the B-A-C-H Fugue is the most deeply thoughtful of all the pieces in this excellent recital, a fact admirably appreciated and communicated by Campanella. Here is a combination of qualities far ahead of their time, all demanding ferocious Lisztian virtuosity.

I was happy to find that Campanella included the charming Valse Impromptu, so rarely recorded these days. The Fountains of the Villa D'Este sparkle limpidly, while at the same time Campanella also introduces, as a sort of background, the general atmosphere of their garden surroundings. Funerailles pays its respects to death very convincingly indeed. It conveys the emotional effect on the survivors and even a graphic picture of the ceremonial trappings of the funerals of the great.

Campanella's Mephisto Waltz reading offers a new approach that I cannot recall ever having heard before. Campanella makes it more savagely ironic than do most of his many notable competitors, an effective treatment even if it does sacrifice some of the lyricism. There is, for instance, no ballroom atmosphere in the slow section. Instead Campanella turns even this into what can be accepted as a sardonic comment. Altogether a brilliant and satisfying recital.

I was less happy with some of the transcriptions in his second recital. I liked his legato pedalling in the Tannhauser Overture, an effect that prolongs the notes of the opening Pilgrims Chorus to give them, so far as is possible on a percussion instrument, the effect of sustained string tone. What I didn't like was the almost dead pan evenness of his tone and tempo which made it sound a little too much like a funeral march!

The central Venusberg section goes much better, despite the difficulty of transferring Wagner's particular kind of orchestration to a piano. And in the final statement of the Pilgrims' Chorus at the end of the overture the descending accompanying figure in the treble is made to sound almost like a chime of bells.

Unfortunately he then passes without a pause into the Parsifal Act 1 Transformation music, a piece in which bells actually do play an important part in the orchestral version. Campanella omits none of the music's stateliness and the transcription is itself of a higher quality than the Tannhauser.

In the Ring extract, the sword theme sounds a little odd with its repeated first note instead of Wagner's own dominant-tonic interval. Did Liszt do this intentionally or was it perhaps a faulty memory of the simple theme?

In the Spinning Song from the opening Act 2 of the Flying Dutchman, the accompaniment seldom sounds like the murmuring strings in the original orchestral version and has a change of tempo in the middle that I found a little tiresome (I don't mean the Senta aria). And by the way, the top notes of his piano sound uncomfortably out of tune, though whether this is due to the engineering or the tuning of the instrument I cannot say.

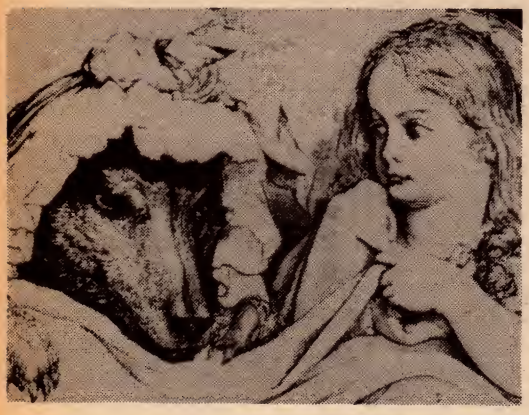
The best written of all the transcriptions on this disc is the Liebestod from Tristan and Isolda, perhaps because it was written much later than the others — with the exception perhaps of the Parsifal interlude. But even in this transcription the repeated notes are all too reminiscent of the piano organs so popular in London streets before World War 1.

I would like to make clear that my disappointment with this disc is not so much due to Campanella's playing — it was his first recorded recital — but rather to the questionable quality of the music he plays.

Lighter Side

Reviews of other recordings

Stories for children: "violent" fairy tales and "gentle parables" . . .



GLENDA JACKSON reads from the Glenda Jackson Story Book. Stereo, World Record Club WRC R 05207.

"Aha!" I thought, when my review copy of this album turned up; "I know just the family that will enjoy listening to it."

But having listened to it myself, I wasn't quite so sure. The stories, expertly read by Glenda Jackson from the Glenda Jackson story book, are the original versions, just as I heard them in my younger days, before people started worrying about the violence in fairy tales.

The wolf eats Grandma whole and Little Red Riding Hood suffers the same fate. When the huntsman appears, he doesn't hesitate to slit open the wolf's stomach while it obligingly sleeps on, and enlists Little Red Riding Hood's aid in filling the vacant space with a load of stones which proves fatal for the wolf!

And the wicked queen orders Snow White to be killed, cheerfully sitting down to a meal of tongue and heart in the mistaken belief that they have been cut from the corpse of her diminutive rival in the beauty stakes. But in the end she reaps her just reward by being forced to dance for the wedding guests in red-hot cast-iron shoes!

Ouch!

So instead of being set aside as a present, the album was grabbed by another member of the household as the starting point for a projected classroom debate on violence in children's literature.

Perhaps I should note that, compared with "Little Red Riding Hood" and "Snow White", "The Three Bears" is very tame: no one gets killed or eaten or anything! (W.N.W.)

☆ ☆ ☆

OSCAR WILDE. The Happy Prince; The Star Child. Read by Robert Morley. Music by Kenny Clayton. World Record Club, stereo, WRC R 05246.

There could hardly be a greater contrast in children's stories than between these two and the three fairy tales read by Glenda Jackson and reviewed elsewhere. The fairy tales are traditional and familiar but, in two cases out of three, involve equally traditional violence.

By contrast, the two stories by Oscar Wilde are gentle parables, which will be new to most children and which emphasise the kindness which people can show to one another, even in a world which abounds in cruelty and intolerance.

My one regret, in listening to Robert Morley's reading, was that his intonation kept reminding me of Mr Heinz' soups, which he used to extol so frequently in TV commercials. But, despite that rather inappropriate association, if I had occasion to play one or other of the records to a group of children, this is the one I would normally choose! (W.N.W.)

Devotional records

SACRED SONGS. Kenneth McKellar at Paisley Abbey. Stereo, World Record Co, WRC R05230.

From an original Decca release, this album would appear to be as per label, although there are no explanatory notes on the jacket other than the titles and credits. The sound and ambience is that of an abbey, with backing provided by pipe organ, strings and a choir. The powerful, true voice of baritone Kenneth McKellar leads in a program of traditional sacred songs:

The Lord's My Shepherd — By Cool Siloam — O God of Bethel — Do No Sinful Action — A Sacred Head — I To The Hills — Great Is Jehovah — God Be In My Head — There Is A Green Hill — When I Survey The Wondrous Cross — All People That On Earth Do Dwell — O Come Let Us To The Lord Thy God — O Love That Will Not Let Me Go — The Holy City.

It is a generous program — 40 minutes odd — and one that will be enjoyed by those that appreciate these traditional songs and anthems, sung in the traditional way, embellished only by the resources of an abbey choir. The sound is clean with clarity of diction a notable feature. In its class: excellent. (W.N.W.)

☆ ☆ ☆

THE PSALMS OF DAVID, Vol 2. King's College Choir, Cambridge. WRC R03198. World Record Club Release.

Anyone who has been brought up in the Anglican tradition will appreciate this recording by one of the world's leading group of voices, trained in choral singing of a very high order.

There are excerpts from twelve psalms, in order of playing: 126-65-66-67-114-115-12-133-134-81-22-78. Sleeve notes give the first line and a brief history of the psalms and their usage in services of worship over the centuries.

The recording captures the ambience of a lofty church building and would be a source of inspiration for anyone involved in church music of the more traditional kind.

The original recording was an H.M.V. release. For further information on World Record Club, their address is 605 Camberwell Road, Hartwell, Victoria 3124. (N.J.M.)

Reviews in this section are by Neville Williams (W.N.W.), Jamieson Rowe (J.R.), Leo Simpson (L.D.S.), Norman Marks (N.J.M.), David Edwards(D.W.E.), Greg Swain (G.S.), and Danny Hooper (D.H.).

New direct-cut releases

ORGAN SHOWPIECES. Allan Wicks at the Organ in Canterbury Cathedral. Stereo, World Record Club. WRC R 04185.

The nature of this album is adequately described by its title. The organ is the massive and imposing instrument in the Canterbury cathedral, installed originally by Henry Willis and Sons in 1886. It has been modified and augmented on a number of occasions since then and substantially rebuilt as recently as 1968. It has four manuals and pedalboard, 68 speaking stops and 30 couplers, making a total of 98 registers.

Allan Wicks, organist and choirmaster at the cathedral since 1961 was closely involved in the organ reconstruction and has an intimate understanding of the instrument. It would be difficult to imagine a more massive and complex sound from one man and one instrument than emerges on the last track of this album.

The items: Widor: Allegro (6th Symphony) — Alain: Litanies — Messiaen: Alleluias Sereins (L'Ascension) — Messiaen: Transports De Joie (L'Ascension) — J. S. Bach: Toccata & Fugue in D Minor — Reger: Benedictus — Liszt: Prelude & Fugue on B.A.C.H.

The recording is basically clean in the sense that there is no obvious distortion or overload and a gratifying definition in what must be some of the most acoustically complex sounds ever to grace a groove. At the other extreme, the softest passages might easily be lost in anything but the quietest room and, under these conditions, you will hear some surface prickle.

Judged on conventional standards, it's a pretty impressive album and, if you're partial to the kind of music and the kind of instrument, you won't be disappointed. (W.N.W.)

☆ ☆ ☆

GRATEFULLY YOURS. The Mom And Dads. GNP, Crescendo. L 36658. Festival release.

This one is strictly for the old-time woolshed dance set, with these twelve titles: My Isle Of Golden Dreams — Everywhere You Go — I Left My Heart In San Francisco — Columbus Stockade Blues — Dreamy Melody — The Sheik Of Araby — Maria Elena — Somebody Else Is Taking My Place — Spanish Eyes — Ace In The Hole — Rock-a-Bye Moon — Tennessee Polka. They must be popular because the background of the sleeve photo shows at least seven "gold" records; so good luck to them. (N.J.M.)

☆ ☆ ☆

JAMES GALWAY PLAYS SONGS FOR ANNIE. Stereo, RCA Red Seal. VRLI 7189.

The flute playing skill of James Galway has become almost legendary in recent years and this fine disc from RCA clearly shows why. Ten of the twelve tracks have backing from the National Philharmonic Orchestra. Of the remaining two, he is accompanied by six harps in "Brian Boru's March" and in "Belfast Hornpipe", he plays a tin whistle accompanied by Kevin Conneff on the bodhran or Irish drum.

The other tracks are: Le Basque — Bachianas Brasileirsa Number 5 — Liebesfrued — Berceuse from "Dolly" — Allegro — Annie's Song — Tambourin — La Plus Que Lente — Spanish Love Song — Carmen Fantasy.

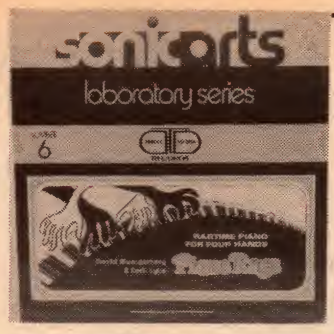
The tracks were recorded at Kingsway Hall and Walthamstow Town Hall over a four month period in 1978 and the quality, except for a little surface noise at the start is good. (N.J.M.)

☆ ☆ ☆

GUITAR MONSTERS, Chet Atkins & Les Paul. Stereo. APLI-2786. RCA Victor.

Those two guitar greats, Les Paul and Chet Atkins, have a ball on this lighthearted album of virtuoso guitar playing.

There is a fair amount of banter on



PIANO RAGS. Ragtime Piano for Four Hands. Stereo, Direct-to-disc. Sonic Arts Laboratory Series No. 6. (From P.C. Stereo, P.O. Box 272, Mt Gravatt, Qld 4122. $19.50 post paid.)

Two pianists, David Montgomery and Cecil Lytle cooperated on the one piano to produce this study in ragtime. The notes explain at length the background to this style of music, laying stress on the flood of ersartz ragtime that brought about its eclipse for many years.

Eight tracks are presented here, with a playing time of just over 27 minutes, and which illustrate three traditional styles: Sedalia, St Louis and New Orleans. The track titles: Hurricane Rag — Original Rag — Juba Dance — The Great Crush Collision March in B Flat — The Entertainer — Bohemia — Kitten On The Keys — Ragamorole — Dictys On 7th Avenue.

With this kind of music, there is no ponderous bass and no sweeping dynamics to exercise the direct cut technology. What is clearly evident, however, is the "bite" in the middle and treble transients, rendered all the more so by the relatively "dry" studio environment used for the recording. One can readily accept the statement in the jacket notes that the LED peak indicators on the panel were showing peaks that would have been 6dB above the headroom of a tape master — had there been such in the chain.

Certainly there is no crushing of peaks, here, and the sound quality overall is very clean. Background noise? No tape hiss, of course; just a faint suggestion of surface prickle here and there.

Will you enjoy it? Technically, there's not reason why you shouldn't. The rest will depend on your attitude to ragtime piano, played in the rather clinical atmosphere of a studio, as distinct from the noisy, ebullient environment of a club or music hall. (W.N.W.)

☆ ☆ ☆

EFREM ZIMBALIST, Father & Son. Philip Frank, violinist; Bernard Frank, piano. Umbrella direct-cut stereo UMB-DD3. (Imported by M. R. Acoustics, P.O. Box 110, Albion, Qld.)

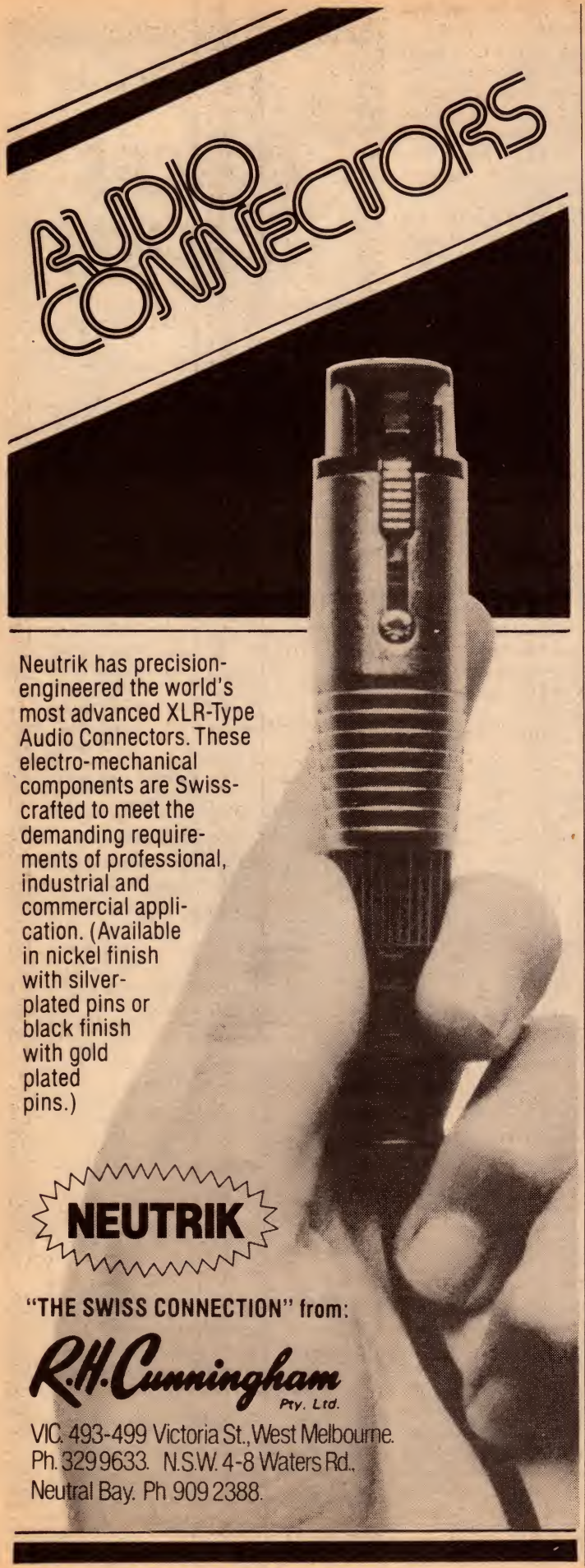
This disc might be regarded as a family affair. Apparently, Efrem Zimbalist and his more noted son, E. Zimbalist. Jr are accomplished musicians and composers. On this disc, two Zimbalist violin sonatas are performed, one composed by the father and one by the son. The other family aspect is that of the Frank brothers who perform the pieces.

The performances are billed as "fine" and the compositions "pleasant and romantic". Without more prolonged listening, I would be disinclined to quarrel with either assessment.

Whatever one's opinion of the may be, the compositions do not seem to be particularly good vehicles for demonstrating the capabilities of the direct-to-disc process. Both compositions have quite a limited dynamic range, the vital aspect where direct-to-disc should excel.

Other aspects of the recording are similarly not outstanding. The recording quality does not seem especially clean (this much should be expected with a price of $17.00) and the overall recording level is such that some surface noise is noticeable when played at high sound levels.

If this appears to be an unenthusiastic reaction, then you have got the right message. (L.D.S.)



THE LIGHTER SIDE — continued

some of the tracks including a few slightly scurrilous remarks about C&W singer, Dolly Parton, but don't let this detract from an enjoyable album.

The tracks are: Limehouse Blues — I Want To Be Happy — Over The Rainbow — Meditation — Lazy River — I'm Your Greatest Fan — It Don't Mean A Thing If It Ain't Got That Swing — I Surrender Dear — Brazil — Give My Love To Nell — Hot Toddy.

The quality is the usual high standard one expects from RCA's Nashville studios. (N.J.M.)

☆ ☆ ☆

A LITTLE BIT OF HEAVEN. John Gary. Stereo, RCA VAL1 0182.

Most of us have a soft spot for those traditional Irish melodies and I doubt that I've ever heard them sung better than by John Gary, as featured on this album. With a voice that ranges over three octaves from rich baritone to an effortless tenor, his presentation is smooth, relaxed and true. The program:

A Little Bit Of Heaven — I'll Take You Home Again, Kathleen — How Are Things In Glocca Morra — Macushla — Kathleen Mavourneen — Irish Lullaby — Cockles And Mussels — My Wild Irish Rose — Galway Bay — Mother Machree — Believe Me If All Those Endearing Young Charms — When Irish Eyes Are Smiling.

Quality is good: Marty Gold's accompaniment is excellent. In a word: recommended! (W.N.W.)

☆ ☆ ☆

SONGS OF STAGE AND SCREEN, Vol 3. Richard Tauber, With Orchestra Accompaniment. Word Record Club. WRC R 03897.

Anyone old enough to have a few grey hairs will remember Richard Tauber, one of the best loved singing stars of a few years ago, especially in the world of operatta and musical comedy. The fourteen tracks have carried their years very well, having originally appeared on the "Parlophone" Label.

If you remember the songs, no doubt you will recall the shows they came from: Don't Ask Me Why — Indian Summer — I'm In Love With Vienna — My Hero — Ah Sweet Mystery Of Life — Only A Rose — One Night Of Love — Pedro The Fisherman — At The Balalaika — Marcheta — Tristesse — I'll See You Again — Sleepy Lagoon — All The Things You Are.

Although the label says stereo, there is hardly any difference switching from mono to stereo when playing, so don't expect a wide screen sound. (N.J.M.)

☆ ☆ ☆

LIVE! BE IN IT. Skyhooks. Mushroom Records. L 45831/2. Festival release.

Skyhooks are: Shirley Strachan: lead vocals; Bongo Starr: guitar, vocals; Freddy Kaboodleschnitzer: drums, vocals; Greg Macainsh: bass, vocals; Bob Spencer: guitar, vocals.

This live, double album contains such songs as: Mercedes Ladies — Balwyn Calling — Sitting In A Bar In Adelaide — All My Friends Are Getting Married — The Bruce Suite — Kaboodleschnitzer Kommercials — Wild In The Streets — Do The Hook — Brown Sugar — Bondage On The Boulevard — Party To End All Parties — Sex Is Not A Dirty Word — Women In Uniform.

This double album is a compilation of songs recorded by the A.A.V. Mobile at: The Sidney Myer Music Bowl, Festival Hall, Council Club Hotel, Commodore Hotel, Nightmoves Concert No. 2, Palais Theatre.

The recording is very clear and altogether Skyhook's latest double album "Live! Be In It" is good, although some of the lyrics may offend. (D.H.).

FIESTA IN ACAPULCO. Trio Los Uruguayos. WRC S/5124. World Record Club Release.

For those who like their music in the South American style, this record would be sure to please with fourteen tracks as follows: El Caiman — La Bamba — El Jarapetapatio — Guantanamera — Ne Nanagui — Ay Ay Ay — El Caiman — Balaju — Torito De Barranca — Adelita — La Cucuracha — La Golondrina — Cielito Lindo — Balaju.

Information on the record sleeve is very sketchy, indicating little beyond the fact that the original recording was by Ariola-Eurodisc. The overall quality is excellent. (N.J.M.)

☆ ☆ ☆

ALL I WANT TO DO . . . Lee Conway. Image Records. ILP 793. Astor release.

Lee Conway is an Aussie truck driver with a very deep voice. This is his third album, and it's a very good effort. He has picked songs covering a fairly wide spectrum of country styles, including several formerly recorded by Conway Twitty, and Waylon Jennings.

Lee's style is a little hard to categorise, as the tracks all have a flavour of their own. All I can say is that I found this to be a very enjoyable record, and one that I am sure will grace my platter more in the future.

In order, the tracks are: — Why You Been Gone So Long — Never Be Anyone Else But You — Lay A Little Loving On Me — The Door Is Always Open — Amanda — I Fought The Law — I Don't Want To Talk About It — All I Want To Do — Lady Of The Wind — Save The Last Dance For Me. Technically, I could not fault this record. (D.W.E.).

I'VE ALWAYS BEEN CRAZY. Waylon Jennings. RCA Victor. APL 12979.

In the title track, Waylon gives us an insight into his life (I've always been crazy, but it's kept me from going insane!). In the second track he tells us about his change in musical direction (Don't you think this outlaw bit's done got out of hand). After that, he gets down to singing real Waylon songs.

My choice of the best track on the first side is "Billy", while on the B side, it falls upon the old Johnny Cash standard, "I Walk The Line". Overall though, I would have to rate this as a disappointment compared to some of his earlier efforts. It's still a good record, but just not up to his usual standard. Technically, the album is very good, however. (D.W.E.)

☆ ☆ ☆

GREATEST HITS. Steely Dan. ABC Records. AK 1107. RCA release.

This two record set contains the following Steely Dan hits from 1972-78: Do It Again — Reeling In The Years — My Old School — Bodhisattva — Show Biz Kids — East St Louis Toodle-Oo — Rikki Don't Lose That Number — Pretzel Logic — Any Major Dude — Here At The Western World — Black Friday — Bad Sneakers — Doctor Wu — Haitian Divorce — Kid Charlemagne — The Fez-Peg — Josie.

All songs were previously released on the following ABC Record albums: "Can't Buy A Thrill", "Countdown To Ecstasy", "Pretzel Logic", "Katy Lied", "The Royal Scam", "Aja". "Here At The Western World" is the one track not previously released.

Steely Dan's latest double is a good one for those who do not own the above albums. (D.H.)

HISTORY FROM THE ABC

AS IT HAPPENED, Sounds and History. Mono cassette. Available from The Cashier, ABC, Box 487 GPO, Sydney 2001. $5.95 incl. postage.

It took the publicity for this cassette to make me actively aware that it is merely the most recent of a whole series of cassettes, records and books available from the Australian Broadcasting Commission.

This particular cassette, which plays for about 60 minutes, is a compilation of interesting snippets from past instalments of AM and PM — the ABC's morning and evening radio current affairs programs.

After a brief introduction by PM's anchorman Huw Evans, the tape opens with a 5-minute segment generally related to the African continent. Then follows a segment to do with the late Sir Robert Menzies, another to do with "Royal Occasions", and another entitled "Americana". Past Australian leaders and the Vietnam War round out

side 1.

Side 2 opens with Israeli affairs, followed by segments on the constitutional crisis, Aboriginal affairs and Australian disasters. Gough Whitlam and Malcolm Fraser wind it up. (Pronounce "wind" any way you like!)

As one who listens to AM and PM regularly while commuting, I had no difficulty in identifying people and occasions spontaneously and I was variously amused and revolted by the memories. For those who need prompting, a pamphlet packaged with the cassette identifies who and where. An interesting release. (W.N.W.)

TAPE PRICES SLASHED

UP TO 40% OFF R.R.P.

While stocks last.

	Size	Our Price	R.R.P.
*Ampex Plus Series IMPORTED	C60	$1.59	~~$2.75~~
	C90	$1.69	~~$3.30~~
Ampex 20/20 Series	C120	$1.79	~~$3.95~~
	C90	$1.89	~~$4.05~~
Top of the TDK Range	C90	$3.99	~~$6.50~~
*Hitachi LN	C60	$1.89	~~$2.32~~
	C90	$2.69	~~$3.29~~
*Hitachi U.D	C60	$2.99	~~$3.95~~
	C90	$3.69	~~$4.68~~
*Dindy Super 5 year replacement guarantee	C46	.89	Save
	C60	.99	while
	C90	$1.29	stocks
	C120	$1.49	last

For Sydney C.O.D. Delivery within 48 hours
Ring ROSS STANDFAST on 438 3855
or Post To:

Dindy Marketing P/L P.O. Box 555
Tweed Heads NSW 2485 Ph. 36 4629
BANK: NSW Coolangatta

ORDER FORM:

QTY.	Type/Size	Price	TOTAL
	Delivery & Insurance		$2.00

TOTAL $ ENCLOSED

EA

Name
Address
Post Code
Phone

SEND FOR FREE CATALOGUE ☐

ADMA

Quality ham gear from VICOM

STATE OF THE ART TECHNOLOGY

Icom

IC701	HF solid-state 160m-10m transceiver	1380.00
IC701PS	Matching power supply/speaker for above	253.00
IC22S	2m fm synthesised transceiver	330.00
IC280	2m fm remotable cpu controlled	450.00
IC215	2m fm portable incl. 5 channels	245.00
IC402	70cm ssb portable, 3 watts	469.00
IC502	6m ssb portable, 3 watts	239.00
IC202E	2m ssb portable, 3 watts	239.00
IC202S	2m ssb portable, 3 watts	357.00
IC211	2m all-mode ac/dc transceiver	799.00
ICRM3	Remote control unit	169.00
ICSM2	Condenser-elect desk mic	45.00
LC-25	Leather case for portables	12.00
FA-1	Rubber ducky for 215/202	12.00
MMB-E	Mobile mount 211/701	22.00
MMB-B	Mobile mount 215/4026202	22.00
BC-20	Nicad pack for portables	69.00
CK-28	Remote cable kit IC280 incl cable, case cover, head mount & screws	38.00
MMB-F	Mobile mount IC22S	22.00
EX-1	IC701 interface kit for linear	43.00
HC-HP1	Icom headphones	54.00
IC-CF1	Optional cooling fan for IC701PS	45.00
HM-1	Hand ptt mic, low Z	18.00
IC-511	6m all-mode ac/dc transceiver (coming soon)	

ICOM

ICOM IC-280 remotable 2m FM mobile

Frequency 143.90-148.11 MHz • Power: 10 watts Hi, 1 watt adj. Low • Power requirements: 13.8 VDC at 2.5 amps • Main PLL control head may be detached and remotely mounted • With microprocessor, stores 3 frequencies • Easy to read LED's.

KENWOOD

TS520S	HF TRANSCEIVER 160-10m	735.00
TS120V	HF MOBILE TRANSCEIVER	630.00
TS820S	HF TRANSCEIVER DELUXE	1,150.00
AT200	ANTENNA TUNER	185.00
SM220	STATION MONITOR	440.00
BS-5	PAN ADAPTER	66.00
TL922	LINEAR AMPLIFIER	1,389.00
TR7400A	2m FM SYNTHESISED	542.00
VC-2	TWIN METERS 3-150 MHz	35.00
SWR200	OSKERBLOCK 3-200 MHz	86.00
SW210A	DAIWA TWIN-NEEDLE 1.8-150 MHz	99.00
SW410A	DAIWA TWIN NEEDLE 140-500 MHz	129.00
SWX777	DAIWA TWIN NEEDLE 1.8-30 MHz	131.00

antennas

	HUSTLER ANTENNAS	
BM-1	Deluxe universal bumper mount	25.00
RM80	80m resonator	30.00
RM40	40m resonator	25.00
RM20	20m resonator	16.50
RM15	15m resonator	16.00
RM10	10m resonator	15.00
MO2	fold-over mast (reqd. for all resonators)	33.00
RSS-2	medium duty spring	13.00

Jaybeam

5Y/2m	5el 2m, 7.8dBd gain, length 1.6m	43.00
8Y/2m	8el 2m, 9.5dBd gain, length 2.8m	51.00
10Y/2m	10el 2m, 11.4dBd gain, length 4.4m	84.00
10XY/2m	10el 2m cross yagi, 11.3dBd	84.00
D8/70cm	twin 8el, 70cm, 12.3dBd gain, 1.1m	64.00
PBM18/70	18el, 70cm, 14.9dBd gain, length 2.8m	71.00
MBM4870	48el, 70cm, 15.7dBd gain, length 1.83m	83.00
MBM8870	88el, 70cm, 18.5dBd gain, length 3.98m	102.00
PMH/2C	Phasing harness	18.00
	NAGARA	
SS56	6m 5 element beam, 1 Kw	159.00
V5JR	80-10m trap vertical, 6.7m high	129.00
V4JR	40-10m trap vertical, 5.2m high	99.00
	DISCONE ANTENNAS	
GDX-1	80-480 MHz commercial discone	85.00
SCAN-X	65-530 MHz (receive only)	39.00

Morse keys

HK702	Deluxe key with marble base	41.00
HK708	Economy key	23.00
HK706	Operator's key	25.00
MK701	Manipulator (side-swiper)	45.00
EK103Z	Electronic keyer	336.00
PALOMAR	IC keyer	149.00

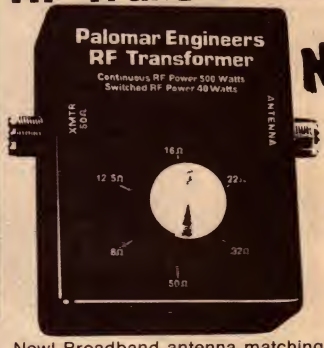
Antenna couplers

CNW217	DAIWA incl SWR/PWR, direct reading, 200w	199.00
CNW417	DAIWA incl SWR/PWR, direct reading, 500w	245.00
MFJ901	Matches everything 1.8-30 MHz	112.00
MFJ16010	Random wire tuner 160-10m	79.00
MFJ941	160-10m, 300w. incl SWR/PWR	139.00

Rotators

DR7600S	Heavy duty with controller & mast clamps	289.00
DR7500S	Medium duty with controller & mast clamps	199.00
6 CORE	Cable for above (200m rolls)	1.00/m

Palomar Engineers 500 Watt RF Transformer



NEW

$49

- New! Broadband antenna matching
- For mobile whips and all short vertical antennas.
- Convenience switch selection of impedance taps.
- Taps at 8, 12.5, 16, 22, 32, and 50 ohms.
- Small size. High efficiency.
- RF ferrite toroid core.
- Teflon insulated wire.
- Full 500 watt CW capability. No time limit.

SCOOP PURCHASE

Leader Tr Dip Meter LDM815 1.5-250MHz

Get those tuned circuits "into the paddock"

$124.00 P & P $2.00

Multimeters

DM3003	Digital DAIWA	120.00
TP-10S	2000 ohms/v	29.50
117 FET	Quality for service tech.	54.00
S-100TR	100,000 ohms/v plus Xistor checker	75.00
ZQM3	Transistor checker	59.00
OB-330	20,000 ohms/v incl. field strength	41.00

From DAIWA

cross-needle

CN-620

$99

SWR & Power Meter

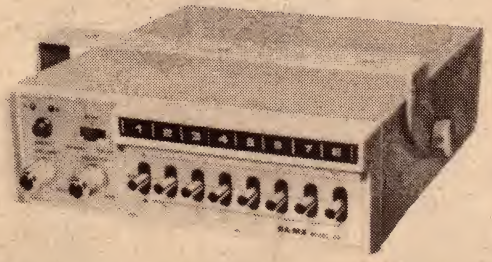
Simultaneous direct reading SWR, Forward Power and Reflected Power
Frequency Range: 1.8-150 MHz
SWR Detection Sensitivity: 10 W Min.
Power: 3 Ranges FWD 20/200/1000 w)
Input/Output Impedance: 50 Ohm

NEW

747 AIRCRAFT RECEIVER

- SCAN OR MANUAL
- 16 CHANNELS (4 CRYSTALS SUPPLIED)
- AC/DC OPERATION
- IDEAL FOR CLUBS, SCHOOLS, AIRCRAFT

Price $199.00



AMATEUR RADIO DIVISION

VICOM

HEAD OFFICE AND MAIL ORDERS

68 Eastern Road
SOUTH MELBOURNE VIC 3205
PH (03) 699 6700 Telex AA30566

DEALER ENQUIRIES INVITED

Sydney	681.3544
Adelaide	43.7981
Gold Coast	32.2644
Canberra	82.3581
Melbourne	836.8635
Perth	321.3047
Hobart	43.6337
Cairns	54.1035
Launceston	44.3882
Ballarat	32.7234
Brisbane	38.4480

AMATEUR RADIO

by Pierce Healy, VK2APQ

A new challenge: weather and TV satellites

As distinct from the OSCAR series of amateur communication satellites, international weather satellites can provide the basis for a range of interesting experimental projects for amateurs and hobbyists, as this month's feature story illustrates.

An overseas visitor to Sydney in February, 1979 was John St Clair, ZS2JR of Port Elizabeth, South Africa. Despite heavy business commitments, John found time for a brief visit to the VK2APQ location, to tell of his interest in weather satellites and to express the wish that he would like to find some fellow enthusiasts in the field of satellite weather picture reception. He describes it as a "bug" which bit him some nine years ago and which still provides an interest and a challenge for him. John regards himself as a "detribalised" Australian, having been born in Cremorne and grown up in Roseville, near Sydney.

John is the only amateur in South Africa actively receiving signals on 1691MHz, although there are a few who have been receiving excellent pictures from the American and Russian orbiting satellites in the 137MHz band. His current interest is receiving pictures from Metrosat, the latest geostationary weather satellite operated by the European Space Agency. Metrosat is located over the Greenwich meridian and over the equator. From his location in Port Elizabeth, it is at an elevation of roughly 52 degrees from the horizontal and about 40 degrees west of true north. John points out that Sydney amateurs would find GMS-1, the Japanese geostationary satellite at much the same elevation from Sydney.

Although adequate signals have been received on a dish antenna one metre in diameter, John now uses a two metre diameter spun aluminium dish cut from a surplus Post Office microwave dish. Originally four metres in diameter and weighing 250 kilograms, it was just too heavy to handle and more than his wife would tolerate on the balcony!

At the focal point of the dish is a 150mm diameter feed horn (the use of a coffee can is standard practice in the USA) with a 50mm monopole antenna.

At the back of the feed horn is mounted a low noise 1691MHz preamplifier which feeds through six metres of coaxial cable to a 1691MHz to 137.5MHz down converter. This converter consists of two further preamplifiers with filters in between the stages and a crystal controlled local oscillator which feeds through a tripler into the mixer. The resultant signal at 137.5MHz is detected in a two-metre receiver which was originally part of a two-way taxi radio. The band width was changed to 50kHz however, to obtain better contrast in the picture signal.

The picture from geostationary weather satellites such as Metrosat, GMS-1, GOES etc, is typically a retransmission of a picture received at an earth station, computer enhanced, sectioned to present a particular portion of the Earth's disc and then sent back to the satellite for retransmission. The original picture is usually transmitted in the form of digital information in a 5000 line 5000 picture element format. The processed and retransmitted picture for weather service is sent as an FM signal with a modulated 2400Hz subcarrier. It thus appears at the receiver as a warbling tone repeated four times a second for 200 seconds.

John St Clair and his equipment. The top shelf (L-R) houses CCTV and a 6m and 10m converter. On the next shelf is a FAX machine, a Xtal oscillator and tape recorder. Under those is a 20-450MHz Bearcat scanner, a 2m Drake, a 2m Heathkit scanner and a 120-170MHz FM receiver. On the table: RTTY terminal, SX42 receiver, FRG-7, SB-101 transceiver, R288 receiver, and Deskfax on 2m. In the foreground, RTTY teleprinter.

Radio clubs and other organisations, as well as individual amateur operators, are invited to submit news and notes of their activities for inclusion in these columns. Photographs will be published when of sufficient interest, and where space permits. All material should be sent to Pierce Healy at 69 Taylor Street, Bankstown 2200.

In order to produce a picture from the information so transmitted, it is necessary to lock on to the 2400Hz and divide this to produce a four per second pulse to trigger the sweep in a cathode ray tube display. Either that, or record the necessary pulse from a separate crystal controlled oscillator on the second track of the tape while simultaneously recording the picture signal.

John uses both methods, but one trick is to record a clock pulse at 7200Hz while recording at 7½ips. He then plays back at 1⅞ips thus producing an 1800Hz tone. When amplified, this drives the sonic motor of his facsimile machine, so that the drum revolves at 60rpm, reproducing one line of picture information per second and the complete picture in 12 minutes. His TXC-1 facsimile machine will produce either photographic negatives or, by using a wire stylus and a special paper, an instant picture with no darkroom required.

By way of a change, fun can be had by "re-crystallising" a 2-metre receiver for reception of 137.5MHz and catching signals from TUROS-N, the latest American orbiting satellite. This satellite orbits the earth about 14 times a day and is sun synchronised. It may be picked up on its first south to north pass between 1pm and 3pm and a second or even a third pass will follow at 100 minute intervals. The signals from this satellite present a picture of the Earth about 4000km wide and, within the 12 to 18 minutes it is within range, the strip is some 8000km long.

AUSTRALIAN OPPORTUNITY

However, with GMS-1 so easily within range of Australian amateurs, John suggests that that is where the excitement lies and looks forward to Australian amateurs joining him on 1691MHz. He would be pleased to hear from anyone interested in 1691MHz reception and says that working with equipment at that frequency is excellent grounding for his next step, which is to get onto 3.7GHz-4.2GHz, the field of television reception direct from satellites.

Numerous samples of pictures received by John showed in remarkable detail the African continent, Madagascar, and sectionalised areas; and, of course, cloud patterns and cyclonic disturbances.

Mail addressed to him at 42 Towpath, Redhouse, Port Elizabeth, South Africa will, he promised, be answered in between his globe trotting business commitments. He expects to be in Sydney again during 1979.

THE RUSSIAN AMATEUR SATELLITES

It is unfortunate that the time delay is so long in reporting, in these notes, reliable information which comes to hand. However, here are some interesting facts gleaned from the December 1978 AMSAT Newsletter.

An interesting and detailed article by Pat Gowen, G310R, a director of AMSAT, relates to the amateur radio satellites of the Soviet Union known as RS1 and RS2: Radio-Amateuri-Sputniki. The initial letters form a call in the prefix block allocated to the Soviet Union.

The launch took place on October 26, 1978 at 0650 UTC aboard the USSR research satellite COSMOS 1045. At 2012 UTC the same day, G310R and G3FP made what they believe to be the first contact in the United Kingdom through the satellite. The pass time was about 25 minutes, a longer period than OSCAR 7 (22 min.) and Oscar 8 (16 min.).

The following day, the 29.4MHz beacon was monitored by G3LDI, G8QR and G8IFF and the orbit time of 120.3 minutes was fairly well established. As a major surprise of the day, G8QR found that one watt from a vertical dipole on the uplink 145.870MHz-145.915MHz gave a 599 signal return.

The telemetry format proved to be somewhat difficult to resolve but observations and deductions made were later confirmed by information received through RS3A, a special station set up by the satellite group from Moscow, operated by Leo Labutin, UA3CR.

Further basic characteristics of the satellites are: RS1 and RS2 are identical and in the same orbit. RS2 is now the backup and will be brought into use as necessitated by the state of RS1.

Apogee — 1688km; Perigee — 1724km. Uplink — 145.870MHz to 145.915MHz; Downlink — 29.350MHz to 29.395MHz. Power source — solar cells. Antennas — inverted "V" for two metres and quarter wave for 10 metres.

Sensitivity — Recommended power uplink is 50-100mW. 1 watt erp gives a 599 return. All users are asked to rur that power, which gives more downlink strength than the 29.04MHz beacon. Higher power loading will cause loss of the transponder.

The RS satellite has been designed to suit the USSR limit of 5 watts maximum input for technicians on the 2-metre band, hence its superb sensitivity. Ten watts erp will block the ALC system and render all signals, including the beacon, totally unreadable. If sustained, the transponder will revert to beacon mode, and once out of range of the Soviet command station, cannot be put on again until the next pass.

All amateurs are requested to abide by the IARU international band plan and not use channels within the 145.800MHz and 145.999MHz space band for simplex FM QSO's. Even powers of a very low order will cause interference, while high power on adjacent channels may spill over into the band pass of the satellite receiver.

Already contacts have been made between stations 8000km apart, each with less than 1 watt erp.

The Soviet Union satellite group has already started work on a further satellite and would welcome reports on the current ones from world users.

Several awards are offered for satellite contacts. One such award is a Central Radio Club medal to the first 10 amateurs in each continent who make radio contact through the satellite. Applications should be made to Moscow Radio Club, Box 88, Attn: RS3A, Moscow, USSR.

AMSAT-CANADA is preparing hardware for a geostationary satellite

THE 1979 FACT SYMPOSIUM

The "Future Amateur Communications Techniques" Symposium, held in Sydney in May last year, turned out to be one of the most important events in amateur radio for 1978. The success of this venture has created a demand for a "return" performance.

Accordingly, the 1979 FACT Symposium will be held over the long weekend of 29, 30 September-1 October this year at a venue in Sydney, to be announced. This year's FACT Symposium will again be organised by Roger Harrison, VK2ZTB, and the NSW VHF & TV Group Committee.

The organisers invite any amateurs, or other interested persons, wishing to present a paper at the 1979 FACT Symposium to present a written abstract or synopsis on a topic of your choice — but related to communications techniques — to the committee by or before 30 May 1979. Successful papers will be judged on originality, informativeness, possible future importance and amateur applications. It is intended to publish the Symposium Papers before the event this year.

To enable interstate amateurs, who may not be able to attend, to contribute to the Symposium, the committee invites abstracts from authors who, if accepted, would be invited to submit a paper for publication in the symposium proceedings.

For further information, contact the FACT Symposium Committee, C/-14 Atchison Street, Crows Nest, NSW 2065.

YAESU

bail

a decade of research in HF transceivers brings you the FT-101Z series ... at $799 basic price it's a steal!!

Today's technology, backed by a proud tradition, is yours to enjoy in the all-new FT-101Z (and FT-101ZD) high-performance HF transceiver from YAESU and BAIL. A host of new features are teamed with the FT-101 heritage to bring top dollar value.

Rcvr includes variable IF bandwidth with two 8-pole crystal filters and a highly effective all-new NB circuit with front panel blanking level control. Also included are 10 and 20 dB attenuators, and offset tuning for transmit and receive.
Trans. section uses two 6146 final tubes with RF neg. feedback. An RF speech processor is built in. Available options include DC-DC converter, cooling fan, dig. display/counter unit (for FT 101Z), hand or desk mic, and CW filter. CW filter may be used in addition to SSB filter in CW mode. Write for our full colour brochure today.

Photo shows **FT-101ZD** transceiver with Digital display, **FT-101Z** Analog Model (without digital display) available at **$799** and you add the optional extras if desired. (Accepts 901 series acc. e.g. multiscope, transverter, ant. cplr., etc.)

Prices quoted are recommended retail and include 90-day warranty except power valves and semi-conductors. As the authorised Yaesu agent and factory representative since 1963, we provide complete after sales service and spares.

JAS7879-38

bail

Bail Electronic Services, 60 Shannon St., Box Hill Nth, Vic. 3129. Tel. (03) 89 2213
Branches in all States and A.C.T.

FRED BAIL VK3YS
JIM BAIL VK3ABA

YAESU

bail

HF Mobile FT-7B ... power and performance for the Ham on the move

FT-7B SSB, CW, AM all solid state compact transceiver from Yaesu, 80-10m, 100W peak input.

With all the features of the FT-7, inc. noise blanker, cal., clarifier, semi-break-in CW with sidetone, etc., plus many more:- provision for Digital readout, full coverage on 10M, A.M., Audio peak filter for sharp selectivity and improved S/N ratio on CW, Drive Control, RF attenuator. Sensible compact shape (W230 x H80 x D320 mm inc. heat sink) so that it easily fits into most modern cars. Handy tilt-up foot for desk use. **FT-7B** price, inc. 28.5-29 crystal, mobile bracket, mic., power cable, English inst. book, connectors, and Bail 90 day warranty, **$639**.

Options, YC-7B ext. dig R.O. can be mounted on dash or steering column for convenient and safe viewing, includes adjustable sunshade, **$125**. Extra 10M range crystals **$12** each.

Prices & specs subject to change. All prices inc. S.T. Freight & ins. extra.

bail

Bail Electronic Services, 60 Shannon St., Box Hill Nth, Vic. 3129. Tel. (03) 89 2213
Branches in all States and A.C.T.
Fred Bail VK3YS — Jim Bail VK3ABA

JAS7879 — 35

AMATEUR RADIO

for launching into space, should the opportunity occur during the early 1980s. There are 20 individuals in Canada working on the project; three quarters are licensed amateurs.

AMSAT-UK has been developing the idea of an amateur scientific satellite. The project began early in 1978 at the University of Surrey. Ideas for appropriate kinds of payloads are being solicited. Those considered so far include: a magnetometer experiment; HF propagation experiments on 20, 15 and 10 metre bands; various educational ideas; other beacons with extended codestore; slow scan camera for cloud and land photographs.

URUNGA CONVENTION & FIELD DAYS

The Coffs Harbour and District Amateur Radio Club are sponsoring the 1979 "URUNGA DO" over Easter weekend April 13, 14 and 15. For further details of this very popular annual event on the mid-north coast NSW contact Brian Slarke, VK2ZCQ, PO Box 8, Bellingen, NSW 2454, or join the district net on 3610kHz at 8.00pm Monday nights.

Awards for the Perth Radio League

The Perth Radio League of Western Australia which holds the call sign VK6NFL has announced three awards which are retrospective from January 1, 1979:

BLACK SWAN NOVICE AWARD — This award is available to licensed amateurs and shortwave listeners throughout the world.

1. (a) Overseas applicants — contact 14 VK6 novice licensees including two Perth Radio League members.

(b) Australian applicants — contact 19 VK6 novice licensees including four PRL members.

In both cases the club station VK6NFL counts as a league member.

2. Cost to applicant — $2(A) or six IRC's.

3. Applications to be sent to — W. Main, PO Box 463, Kalgoorlie, WA 6430.

Proof of contacts to be in the form of a certified extract of station log signed by two other licensed amateurs.

4. All contacts to be two-way on SSB or CW and within the confines of the Australian novice frequency allocations. Cross band contacts are not acceptable.

5. All contacts except "endorsed mobile" must be made from the same call area.

WAY 79 AWARD — This award has been made available to commemorate Western Australia's 150th birthday year (1829-1979).

In order to qualify licensed amateurs or shortwave listeners have to gain a total of 150 points between January 1, 1979 and December 31, 1979, both dates inclusive.

Scoring — (a) Overseas applicants — 5 points for each contact with a VK6 full call and 10 points for each contact with a VK6 novice call.

(b) Australian applicants — 2 points for each contact with a VK6 full call and 4 points for each contact with a VK6 novice call. Contacts to be made on the 10 and 15 metre bands only.

All other details as for the Black Swan Award.

ZONE 29 BOUNDARIES AWARD — Qualification: contact one mobile station while they are actually crossing a zone 29 boundary from or into an adjacent zone; ie. 28/29, 30/29, 39/29. The contact must be in progress during the crossing.

The contact must be with a licensed amateur operator on any amateur frequency allocation. Any class of operation or emission is acceptable providing a two-way contact takes place.

All other details are the same as the Black Swan Award.

Correspondence other than applications for the awards should be sent to — The Secretary, Perth Radio League of Western Australia, GPO Box N1102, Perth, WA 6001.

BRIGHT STAR CRYSTALS PTY LTD

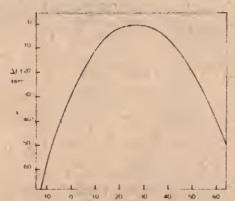
35 EILEEN ROAD, CLAYTON, VICTORIA, 546 5076
(ALL MAIL TO:— P.O. BOX 42, SPRINGVALE, VIC. 3171)

INTERSTATE AGENTS
- **ROGERS ELECTRONICS ADELAIDE Phone 42 6666**
- **HOSE & EQUIPMENT SYDNEY 666 8144**
- **DILMOND INSTRUMENTS HOBART 47 9077**

B.S.C. TELEX AA36004

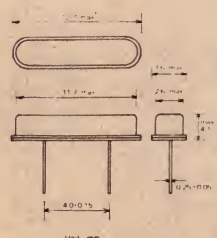
WATCH CRYSTALS

- **WESTEST ELECTRONICS PERTH 337 6393**
- **FRED HOE & SONS PTY. LTD. BRISBANE 277 4311**



SPECIFICATIONS

1.	Nominal Frequency	32.768 KHz
2.	Frequency Tolerance	+30 ppm/28° +1°C
3.	Drive Level	1uW max.
4.	Series Resistance	31.0 kOhms max.
5.	Q Factor	40,000 min.
6.	Parabolic Curvature Constant	Less than —0.04 ppm/°C (Refer Fig. 1)
7.	Turnover Temperature	28.0°C +5°C
8.	Capacitance Ratio	700 max.
9.	Storage Temperature Range	—30°C +80°C
10.	Operating Temperature Range	—10°C +60°C
11.	Aging rate	Less than +5 ppm/year
12.	Shock	Less than 5 ppm for 50 cm Hammer Shock Test
13.	Package Size	



DATA SHEET AVAILABLE. ALSO AVAILABLE CRYSTAL UNITS FOR QUARTZ CRYSTAL CLOCK.

CLUB NEWS

FAR SOUTH COAST RADIO CLUB: After extensive tests by mobile stations operating abound Bega it was found that the original location for the FSCRC channel 3 VHF FM repeater was unsatisfactory.

Negotiations have been underway for resiting the installation on Mount Mumbulla about 16km north of Bega.

Tests so far have indicated that a much greater service area is possible and the repeater is expected to be in operation by Easter 1979.

Reports from stations using the service will be appreciated by the club and should be sent to the secretary, Ken Kelly, VK2MJ, 9 Hill Street, Merimbula, NSW 2548.

WIA, TASMANIA: A correction has been received for the postal address of the Tasmanian Division WIA that was published in the Radio Club Director, December 1978 issue of these notes. The present address is: WIA Tasmanian Division, PO Box 1010, Launceston 7250 Tas.

Also are details of Tasmanian clubs received from Reg Emmett, VK7KK acting secretary Tasmanian Div. WIA.

AMATEUR RADIO

NORTHERN BRANCH WIA: PO Box 275, Launceston 7250. Club call sign VK7NB. Meetings, second Friday each month at club rooms, 34 Bourke Street, Launceston. Enquiries — Joe Gelston, VK7JG. Telephone 44 3882.

CENTRAL COAST AMATEUR RADIO CLUB: The 22nd CCARC annual field day on Sunday February 18, 1979 was an outstanding success and a credit to members' organisation and working committee led by Ross Mudie, VK2ZRQ. The attendance was an all-time record with 820 registrations. (Full report next month.)

NORTH WEST BRANCH: Meetings, second Tuesday of each month at Larkins Hall, Ulverstone. Enquiries — Brian Lord, VK7ZBL. Telephone 42 2545.

WEST AUSTRALIAN VHF GROUP (INC): A report in the January issue of their bulletin states that Graham Gaiger, VK6ZGG of Lesmurdie, Perth has made a two-way contact via the Russian Satellite RS-1 with YB0AT in Jakarta on the Indonesian Island of Java.

Here are the details of the WA beacons and repeaters: VK6RAP channel 2 Perth; VK6RAH channel 4 Perth; VK6RBY channel 6 Bunbury; VK6RAA channel 4 Mt Barker; VK6RAW channel 8 Wagin; VK6RAK channel 8 Kalgoorlie; VK6RTV Perth 145.0MHz; VK6RTW Albany 144.5MHz; VK6RTV Perth 52.3MHz; VK6RTW Albany 52.950MHz; VK6RTU Kalgoorlie 52.350MHz.

JESMOND & DISTRICTS ELECTRONICS AND COMMUNICATION CLUB: Is a progressive Newcastle club open for members who are interested in learning about the fascinating world of electronics, or those who are already experienced in that field and who would help in teaching others.

The club has facilities to instruct young people in electronics using the WIA Youth Radio Service notes and certificates to mark the progress of students. These certificates are invaluable to the holders who may be seeking a career in the ever expanding electronic field.

The first annual meeting was held in February, 1979 when the following officers were elected: president — Keith Hutchison; secretary — John Murphy; treasurer — John Redman, VK2JE; vice president — Grant Gamage; education officer — Leo McKenzie, VK2AAQ; equipment officer — Les Fallshaw, VK2NMS; committee members Peter Hutchison and Harold Whyte, VK2AHA.

Several members have built projects in logic and digital electronics, with enthusiasm being shown towards construction of TV games. The club station VK2BHZ is operated on the 3.5MHz, 7MHz and 14MHz bands.

The club room is in the Regent Theatre Birmingham Gardens near the Moore Street, Rankin Drive traffic lights. For more details telephone Newcastle (049) 57 4633 or 57 5560.

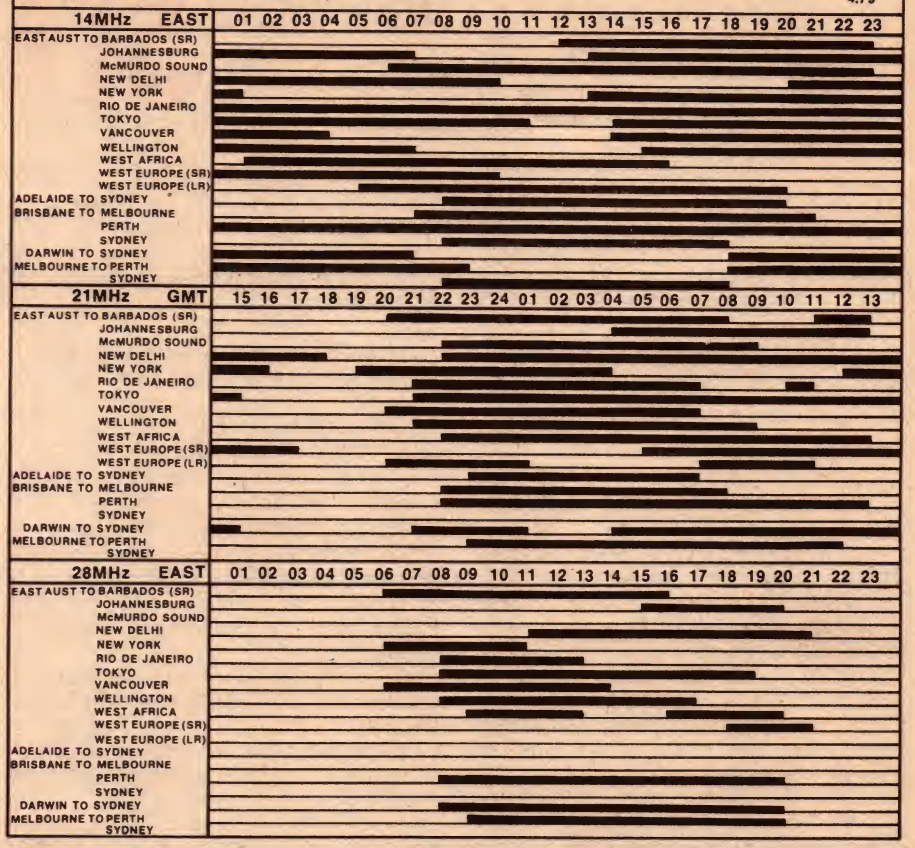
WESTLAKES RADIO CLUB: The novice contest organised by the WRC and held over the weekend December 9-10, 1978 proved to be very popular with novice and full call operators in all Australian states. There were 65 logs received. The winners in the various sections were: Section N (novices) Phone — VK6NDZ 543 points; Open — VK2NVX 761 points; Section F (full calls) Phone — VK8DB 444 points; CW — VK3AXB 227 points; Open — VK4ARR 380 points; Section L (listener) Phone R Weston VK3 283 points; CW — E Trebilcock VK3 25 points; Open — M Hall VK2 453 points; Section R (club) Phone — VK2BHV 83 points; Open — VK3BHU/P 791 points.

The 15th birthday project of the WRC, whose motto is "Progress through Activity", is an 18 metre by 6 metre extension to the club room building. Following long drawn-out negotions with the local authorities, the building permit was received in the last week or 1978. No time was lost and through the enthusiasm of club members and voluntary help from some friends the foundations were laid, the floor laid and the framework erected. The completion of the wall cladding and roofing is now depended on the injection of a few more dollars into the project.

The extensions will add about 75% additional area to the club rooms.

IONOSPHERIC PREDICTIONS FOR APRIL

Reproduced below are radio propagation graphs based on information supplied by the Ionospheric Prediction Service Division of the Department of Science. The graphs are based on the limits set by the MUF (Maximum Usable Frequency) and the ALF (Absorption Limiting Frequency). Black bands indicate periods when circuit is open. 4.79



SO YOU WANT TO BE A RADIO AMATEUR?

To achieve this aim, why not undertake one of the Courses conducted by the Wireless Institute of Australia? Established in 1910 to further the interests of Amateur Radio, the Institute is well qualified to assist you to your goal. Correspondence Courses are available at any time. Personal classes commence in February each year.

For further information write to

THE COURSE SUPERVISOR, W.I.A.

14 ATCHISON STREET, CROWS NEST, NSW 2065

SHORTWAVE SCENE

by Arthur Cushen, MBE

Radio Moscow expands short-wave service

The introduction of the World Radio Service by Radio Moscow has resulted in many new transmitters being put into operation. Reports suggest that a staggering 180 transmitters could commence regular broadcasts on the short-wave bands.

The new World Service of Radio Moscow is now being widely reported as it settles down to a regular transmission schedule. Andrew Lord of Box Hill, Victoria, has been following the programs and advises that the DX Program is now broadcast on Tuesdays at 0832GMT. Moscow Mailbag is now heard on Sunday at 0832, Monday at 0610 and 1010, and Saturdays at 0610GMT. Many frequencies are received during our evening listening and the above sessions are best heard on 15130kHz. At 0800GMT Radio Moscow is using the following frequencies for its World Service in English: 7330, 9450, 9720, 9765, 9780, 11745, 11810, 11975, 12055, 13820, 15130, 15150, 15175, 15195, 15240, 15350, 15360, 15385, 15460, 17700, 17730, 17775, 17805, 17820, 17825, 17840, 17855, 17880, 21530, 21575, 21590, 21600 and 21645kHz.

At 0900GMT the Radio Moscow program continues on the same 33 frequencies.

THE VOICE OF INDONESIA

The Voice of Indonesia, which was recently reported as using 15200kHz, continues to be received on this frequency between 0100 and 0200GMT during their English broadcast. The frequency is also used from 0800-0900, and again from 1400-1500GMT.

RADIO NEW ZEALAND SCHEDULE

Radio New Zealand, through its short-wave service from Wellington, has reduced the number of frequencies for the present transmission period up to May 6.

The broadcasts, to the South Pacific, are: 1800-2130 on 11960; 1800-0630 on 15345; 2130-0800 on 17770; and 0630-1230GMT on 6105kHz. The transmission to Australia 0800-1200GMT is on 6105kHz. There has been an extension to the transmitting time of the short-wave services, which will allow the relay of midnight news reports and commentary from the domestic stations.

The power of the two transmitters in use is 7.5kW and the address of the station is: The Shortwave Service, Radio New Zealand, PO Box 2092, Wellington, New Zealand.

LOWER CHANNEL FOR HCJB

Station HCJB in Quito, Ecuador, has announced plans to use the 90-metre band from May to carry local programs in Spanish and Quechua. The power of the transmitter will be 10kW and listeners in the South Pacific will be keen to verify Ecuador on this band. This is not the first time that HCJB has used a low frequency for its gospel programs. Some 30 years ago we verified a transmission on 4107kHz with local programs for the residents of Ecuador.

Broadcasts to Europe from HCJB have been noted on 9605kHz up to 0830GMT. The frequency replaces 9585kHz, which was in use for some months.

XERMX NEW CHANNELS

Radio Mexico has recently introduced two new frequencies: 15430kHz, which replaced 15385kHz, and 17765kHz. The frequency of 15430kHz is received with clear signals between 0200 and 0300GMT. At 0300GMT the Voice of America opens on the channel with a service to Africa.

The frequency of 17765kHz was first reported by the BBC Monitoring Service and is in use from 2155-0500GMT daily, except on Mondays when transmission time is extended to 0600GMT. Programs are also broadcast on 15430, 11770, 9705 and 5985kHz. One of the highlights is a program called "Radio Mail of the Air" — listeners' letters from 0300-0355GMT daily.

CAIRO ON 12050kHz

Cairo is using a new frequency for its English service to North America. In the past, 12050kHz has been used for Arabic broadcasts but at 0200GMT English is now carried on the frequency up to 0330GMT. A further channel, 9475kHz, is heard with the same program. Cairo has also been noted on 12050kHz around 0800GMT with a transmission in Arabic, and our reception has been much better at this time.

Arabic is also carried on 12050kHz from 0000-0200GMT, when the service is moved to 11745kHz. The transmission concludes at 0300GMT.

KUWAIT USING 21545kHz

Radio Kuwait has been using the 13-metre band for relays of its Arabic services for some months now. However, English transmissions have also been heard on this band. Our reception has been on 2154kHz from 0500-0800GMT. The program consists of news, comment, frequent time checks and popular music. The station closes at 0800GMT, the local Kuwait time being 11am. The transmission on short-wave, in English, is announced as resuming at 1800GMT. The address for Radio Kuwait is PO Box 193, Kuwait.

PACIFIC LOG

The recent frequency changes made by stations on medium-wave in the Pacific area has resulted in many listeners looking for an accurate list. The new frequencies for Australia and New Zealand were published in the January issue of "Electronics Australia".

A new Pacific log has been compiled by Chris Martin of Sydney, the medium-wave editor of DX Post, and this covers stations in the Pacific and parts of Asia. This log is complete in every detail, has a spiral back and covers the frequency range 531-1602kHz. The introduction gives a comprehensive review of the broadcasting organisations in the area.

Notes from readers should be sent to Arthur Cushen, 212 Earn Street, Invercargill, NZ. All times are GMT. Add 8 hours for WAST, 10 hours for EAST and 12 hours for NZT.

SHORTWAVE SCENE

The log itself lists the station call sign, location, country, operating organisation, the type of program, power, address, local time in comparison to GMT, and the operating schedule. There is also an indication of the type of format used by the station, whether popular, middle of the road, or classical, to help listeners identify the station more readily.

The log is available from Chris Martin, GPO Box 1150, Sydney 2001, NSW, Australia.

MADRID RETIMES SERVICE

The English broadcast from Madrid, which is intended for reception in Europe but which also provides an excellent service for morning listening in Australia, has been retimed. The broadcast now commences at 2010GMT instead of 2030GMT. The hour long transmission is repeated at 2110GMT and the same frequencies are used for both services: 7155, 9505 and 11840kHz.

The service to North America 0000-0200GMT is on 9630 and 11880kHz, while a second transmission in English from Radio Exterior de Espana is broadcast 0515-0615GMT on 6065 and 9630kHz.

SIGNALS FROM ICELAND

One interesting station in Europe, which has been heard in this area, broadcasts from Reykjavik, Iceland. In the past, transmissions have been heard at 1200GMT on 12175kHz AM. Noel Green of Preston, in the United Kingdom, reports that this transmission is now carried on single side-band. The transmission opens with an announcement in English and Icelandic followed by a program in Icelandic and a news bulletin at 1225GMT. Transmitter power is 7.5kW.

NEW SWEDISH FREQUENCY

Radio Sweden has adjusted its 13-metre channel from 21610 to 21615kHz for a transmission from 1330 to 1500GMT. The frequency carries English at 1400GMT, but there is light interference from a Radio Moscow Home Service. The same program is available on 21700kHz, which is the strongest signal in this area.

The broadcast in English to Australia and New Zealand from Stockholm continues to be heard on 21690kHz 1100-1130GMT. The single side-band transmission for this area, which is a relay of the Swedish Home Program, is also being broadcast on the frequency of 21550kHz from 0630-0830GMT till May 6.

The Swedish Telecommunications has announced that it has been granted additional funds to improve the transmitting aerials at the Horby transmitting site. The funds will be used for curtain antennas to improve reception of Radio Sweden in North America and East Asia.

Radio Sweden's English transmission to Australia features a Mail Bag session on Sundays at 1115GMT with Stanley Bloom, while on Tuesday at the same time, Sweden Calling DXers is compered by George Wood.

LISTENING BRIEFS
EUROPE

FINLAND: Helsinki has made a frequency change for its transmission from 1300-1430GMT. The frequency now used is 15400kHz, which replaces 15210kHz.

VATICAN: The Vatican Radio is using 11725kHz in place of 11705kHz for the transmission to Australia and New Zealand. This broadcast in English 2210-2225GMT is also available on 9615 and 15120kHz. Vatican's new frequency resulted in my suggestion that a change would be for the better because of interference on 11705kHz from both Radio Sweden and WYFR. The Vatican also tested on 11745kHz for this broadcast, but the frequency was not successful in New Zealand because of interference from Radio Moscow broadcasting in Portuguese on the same frequency.

NORWAY: Radio Norway at Oslo on 21730kHz is being well received in Adelaide, according to J. F. Smyth-Blood. Our reader reports excellent reception during the transmission 1100-1230GMT, which includes English on Sunday during the last 30 minutes of the broadcast. The transmission is also carried on 17840kHz, and this frequency is beamed to Australia and Indonesia.

BELGIUM: Brussels has made some frequency changes for its transmission at 1710GMT beamed to Africa. The new channels are 17745 and 15285kHz and they replace 17740 and 11940kHz, according to Jim Benzoni of Hamilton, NZ. English is broadcast 1710-1755GMT.

AFRICA

LIBYA: The short-wave relay of the Libyan Broadcasting Corporation domestic service, in Arabic, has been observed on the additional frequency of 11700kHz. This transmission operates from 1000-1615GMT in parallel with the previously heard frequencies of 21650, 17800 and 6080kHz, according to BBC Monitoring Service.

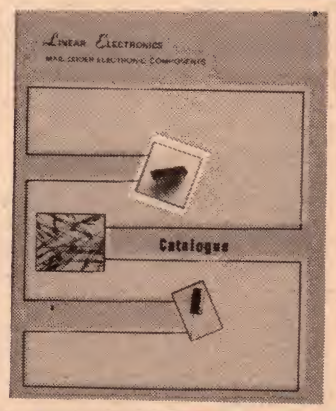
NIGERIA: Lagos Radio has been observed broadcasting in French at 1930GMT on 15185kHz. At 2000GMT there was inteference from WIMB Red Lion PA, which opened with a gospel program.

ASIA

BANGLADESH: Radio Bangladesh has been heard by Leigh Morris of Palmerston North, according to a report in the New Zealand DX Times. This broadcast operates 1815-1915GMT in English and is on 11765 and 15285kHz. The best reception is on 15285kHz with an English news bulletin at 1900GMT, read at slow speed. The broadcast originates from the studios at Dacca, and is beamed to Europe.

SRI LANKA: The English broadcast for Europe, previously heard from 1845-1945GMT, has recently been replaced by transmissions in English and Arabic for the Middle East and Africa on 11870, 15120 and 17850kHz from 1800-1945GMT. English news is now heard at 1800GMT instead of 1900GMT as in the past.

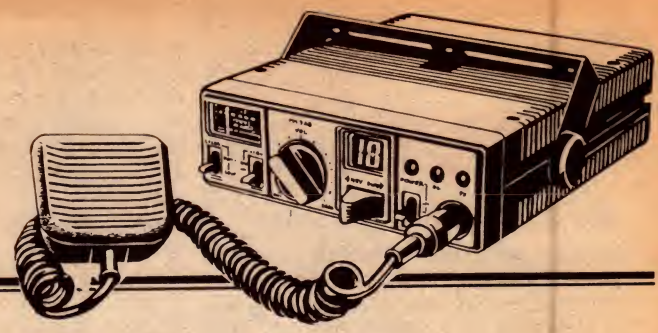
FREE 78/79 CATALOGUE



WRITE FOR YOUR COPY NOW!

LINEAR ELECTRONICS
MAIL ORDER ELECTRONIC COMPONENTS
P.O. BOX 254, PUNCHBOWL 2196

The Australian CB SCENE



SCHOOL OF THE AIR — IN MELBOURNE SUBURBS

An HSC English teacher at the Box Hill Technical College has come up with a new and novel use for UHF CB radio — as the basis for off-campus tutorial discussions to assist students who may not be in a position to attend regular formal classes.

The teacher backing the scheme is Miss Margaret Rivers, who is already using a small UHF CB network based on the college to provide back-up tutorials for her students on predetermined evenings.

She sees the possibility of such a system being expanded to meet the need of adults who, while keen to expand their education, are not free to attend formal classes. They could participate in correspondence courses, supplemented by two-way radio tutorials, which would be shared by others doing the same studies.

The "school-of-the-air" concept is not new, of course. In Australia, it dates back to the "Flying Doctor" era, when the then-primitive two-way radios were used to supplement the education of children in Australia's outback. More recently, tuition by radio was developed and used by Christian missionary organisations in Papua New Guinea and elsewhere.

The essential difference is that Miss Rivers' scheme involves higher level education for adults and young adults in a suburban environment.

It also involves the use of CB radio which is readily available and which, at other times, could be used for ordinary two-way CB contacts. The number of channels available on the UHF CB band, together with the relative freedom from interference and "skip" reception makes the idea of group participation highly practical.

This much became evident when UHF CB radios were installed at the homes of eight students who were enrolled for an off-campus correspondence course at the Box Hill College.

It has become apparent that housewives, who feel that they have been out of touch with education for too long, would welcome the opportunity to join educational groups without having to upset the routines of the home.

Again, many people, both men and women, lack the confidence to front up to formal classes in a school situation where, at an earlier stage in their life, they may have failed to achieve the desired qualification. For such people, and for others tied down by full-time or part-time employment, a correspondence course supplemented by group discussions from the home environment, could be an ideal way to broaden their education.

Miss Rivers' present students age from 19 to 55, and talk to her and to some of their fellow students from homes at Hawthorn, Glen Iris, East Kew, Noble Park, Ferntree Gully, Eltham and Lilydale.

The Philips UHF 320 set, the world's first 40-channel ultra high frequency CB radio, is ideal for this kind of application, being used both in the homes and for the Box Hill base station.

The idea to use the economical UHF CB radio method came from Graeme Scott, 37, the Education Department training advisor for electronics.

"The radios work on the new UHF band, on a much higher frequency than the notoriously clogged channels of the conventional 27 MHz CB band", Graeme said.

"At the end of some sessions, calls coming in have shown that there has been an interested listening audience, people who have been polite not to interrupt the tutorial."

Graeme, who is keen to adopt modern technology in education, wants to exploit and enlarge the network with more subjects and more sets.

"All we need now is the equipment to get on with the job we already know we can do".

(Box Hill Technical College, which is a Technical and Further Educational (TAFE) College, is administered by the Technical Schools Division of the Victorian Education Department.)

TECHNICAL GLOSSARY — continued

BACKGROUND NOISE: Basically, noise heard in addition to the wanted signal. It can come from a number of sources. "Atmospheric" noise or "static" is caused by lightning or other electrical phenomena in the atmosphere, either close by or perhaps hundreds of miles away when the band is "open" to long distance reception. Man-made interference is due to electrical discharges in high tension mains or street or house wiring, or a whole variety of electrical devices. Road vehicles, particularly ignition systems, are another prolific source. But even in the complete absence of atmospheric or man-made electrical interference, some "rushing" noise may be apparent behind weak incoming signals. This is due to random electron movement within the transistors and other components in the receiver.

BANDWIDTH: Can have a number of meanings. For example, it may refer to the width of a band set aside for a particular activity; thus, Australian 27MHz CB stations operate within a band about 220kHz wide. Again it may refer to the width of an individual channel; each Australian CB channel is nominally 10kHz wide.

Referring to equipment, a receiver will normally respond to signals a few kHz either side of the frequency to which it is nominally tuned; this is referred to as the RF bandwidth, typically in the range 5 to 15kHz. It audio bandwidth would refer to the range of frequencies which its audio systems is designed to handle; typically about 4kHz for a CB receiver. Even CB antennas have a bandwidth over which they will operate efficiently.

The Australian CB SCENE

BEAM ANTENNA: A type of antenna so constructed that it radiates signals predominantly in a particular direction; in receive mode, it is particularly senstivie to signals from that same direction. A beam antenna may use multiple "driven" elements, indicating that they are each connected to the down-lead to transmitter or receiver. Conversely, a beam may use only one driven element, others being "parastic"; that is, while being cut to specific lengths and critically positioned, relative to the driven element, they do not receive energy directly from, or feed energy directly into, the down-lead.

BEAT FREQUENCY: When two signals interact, they tend to produce additional signals at frequencies equal to their sum and their difference. The "beat" or "heterodyne" phenomenon is fundamental to a superheterodyne receiver, where the incoming signal is made to beat with (or heterodyne) one produced by an in-built oscillator to produce a new signal which can be handled by the IF (intermediate frequency) channel. Many other examples could be quoted. A less fortunate illustration of the beat phenomenon is provided when a number of AM transmitters try to operate simultaneously on the one CB channel. Their signals interact in the receiver's detector to produce beat frequencies equal to the difference between their exact frequencies — isually a few Hertz or a few hundred Hertz. Hence the growls and whistles!

CARRIER: Nominally, the unmodulated RF signal produced by a transmitter. Although still used as a standard term, the word "carrier" is based on the early misconception that the RF output from a transmitter "carried" the audio components to the distant receiver. It is now understood that modulation produces sidebands which are RF signals in their own right, capable of being radiated and received in the same way as the so-called carrier. In an ordinary AM transceiver, carrier and sidebands are radiated simultaneously and recombined at at the receiver to reconstitute the audio signal. In an SSB transceiver, the carrier is actually suppressed and only sideband signal is radiated. An SSB receiver provides its own locally generated signal to take the place of the missing carrier

CHANNEL: A band of frequencies within which the carrier and sidebands of a transmitter should be confined during transmission. Typically, the signal from a well adjusted and correctly operated CB transmitter will remain within a channel 10kHz wide; that is, within plus and/or minus 5kHz of the officially designated carrier frequency. However, if a CB transmitter is badly adjusted or deliberately overmodulated, it will produce spurious emissions well outside the normal channel and cause interference or "splatter" in other CB channels.

CHARACTERISTIC IMPEDANCE: More simply, the term can be taken to mean a "natural" impedance. In the context of CB radio, the term may readily be encountered in connection with antennae, where a certain type of antenna may be said to have a characteristic (or natural) impedance of so many ohms. (See Antenna Impedance). The term may also occur in connection with coaxial cables and reference should be made to the paragraph under this heading.

CLASS-A AMPLIFIER: Class-A, class-AB, class-B and class-D are all expressions which electronics engineers use to summarise the way in which an amplifier stage is intended to operate, in terms of bias, supply voltage, current drain and signal drive. The terminology was originally devised to described valve operating conditions but it is now used in connection with transistor circuitry, with only minor variations in sense.

COAXIAL CABLE: The term coaxial, meaning concentric, basically refers to a type of cable consisting of an inner conductor, surrounded by a layer of insulation, then an outer conducting sheath, usually of woven copper. Over this there is usually another layer of insulation to isolate the conductors and to protect them from damage and/or weathering. Cables intended for audio applications, although of coaxial configuration, are normally referred to simply as "shielded cables". Those intended for use as RF transmission lines are fabricated with this application in view and are normally referred to as "coaxial cables. Most CB radio installations call for a coaxial cable to feed the antenna, having a characteristic impedance of 50 ohms. This figure is determined by the inherent capacitance and inductance of the cable and this depends, in turn, on the relative diameters of the conductors and the nature and dimensions of the insulation between them. Typical 50-ohm coaxial cable can have an overall diameter of as little as 4mm or as much as 100mm. Broadly speaking, the larger diameter cable, with heavier conductors, has lower resistive loss than smaller diameter cable — a difference that is worth considering when long runs of cables are involved. Also, cable loss is much more likely to be a problem at higher frequencies; therefore it is more serious in the 470MHz CB band, as compared with 27MHz.

printed circuits

- Accurately machine printed etched
- Phenolic & fibreglass-gold tin plated
- EA R & H ET Philips Mullard available
- Specials to your drawing
- POSTAGE small 80c large $1.10.

	$		$		$
—	—	—	—	79UP1	5.00
79S1	4.50	79W3	2.60	79CL1	2.60
791T2	5.00	78SB12	3.00	78S12B	2.20
78S12A	5.50	781M12	3.00	78UP10	7.00
78N10	2.60	78C11	3.10	78DT10D	2.00
78DT10C	2.50	78DT10B	2.80	78DT10A	6.50
ET813	3.50	ET143	2.80	ET141	4.20
ET812	2.80	ET593	3.20	ET490	2.80
ET556	6.00	78DB11	2.80	78UP9	6.00
78BBd9	3.50	555	4.00	650C	2.60
650B	2.60	650A	4.00	138	3.80
718	2.60	553	3.00	811	3.30
590B	8.00	590A	8.00	78MC10	4.00
78E09	2.50	ET605	7.00	ET391B	2.50
ET391A	2.50	ET551	3.00	ET641	ON/AP
ET591C	2.20	ET550	2.80	ET592	4.50
78UT9	16.00	78MX9	3.30	78T9	2.30
78UM8	2.60	78CL8	3.00	ET638B	3.00
ET638A	4.00	ET248	2.30	ET318	7.00
ET591	4.00	ET810	2.80	78TM8	2.80
78TSC7	2.50	78PT7	2.50	78VBG7	3.50
ET137B	2.80	ET137A	3.50	ET139	2.50
ET717	3.50	ET587	7.00	ET640	16.50
78F6B	3.50	78N	2.80	78A06	2.80
246	4.00	489B	2.50	489A	2.80
78CD4	2.60	78PS5	2.50	78C5	3.20
78UP5	5.00	ET140D	4.00	ET140A	14.00
ET1140P	5.50	ET136	2.50	ET487B	7.50
ET487A	750	ET588 20	10.00	78NG4	3.00
78UT4	4.00	78EK3	3.30	78T3	3.60
78B2	3.00	781A2	2.60	ET450B	2.60
ET450A	2.80	ET716	4.00	ET715	3.00
ET486	3.20	ET245	2.50	78C2	3.00
78AF2	3.00	78S3	2.60	78CF1	2.80
77CB12	2.60	77PH12	2.60	77PM12	3.50
ET135	3.00	ET586	2.80	77MX11	2.50
775C11	3.80	77PS11	2.50	77UP6A	3.00
77MX11	2.50	77SC11		77PS11	2.50
ET604	2.50	ET585T/R	3.00	ET635	2.80
ET713	3.00	ASC11	2.80	77UP11	6.50
77TS9	3.00	ET603	3.00	ET583	2.50
ET134	2.60	77AL8	2.50	77T10	2.50
77DVM9	2.80	ET065	2.20	ET071	2.20
ET067	2.20	ET063	2.50	ET083	2.20
ET072	2.50	ET085	2.00	ET084	2.50
ET485	2.80	ET484	3.00	ET581	2.50
ET481M	2.50	ET582B	2.60	ET582A	3.00
ET547	2.50	ET317	2.50	ET712	2.50
77D7	2.50	7787	2.80	77DLT7	6.00
77UP6	3.50	77TTY7	2.80	77QBF7	3.20
ET631/2	4.50	ET481PS	3.00	ET444M	2.00
ET444S	3.00	ET316	2.50	ET549A	2.50
ET548	3.20	77TTY6	2.50	HMS276	6.00
77PTY7	2.80	77PTY6	2.50	ET133	2.60
77E05	3.50	77PRE5	2.50	77UP5	8.50
ET081	2.20	ET062	2.50	ET546	2.50
ET632U	4.00	ET632	7.00	77TTY4	2.50
77CC4	3.00	77UP2	3.00	ET132	2.50
ET632C	8.00	ET632B	6.50	ET632A	6.50
77UT2	3.00	77F1B	2.50	77F1A	3.20
ET633FR	6.00	77UT2	3.00	ET633	6.00
ET632P	2.50	ET632M	7.50	ET482B	2.80
ET482A	6.50	76CL12	2.50	ET630	2.20
76B4	2.60	ET480PS	2.50	ET480	2.80
ET631	7.00	ET630	2.20	ET066	2.20
ET064	2.00	ET449	2.20	ET804	2.80
ET448A	2.20	ET448	2.80	ET711C	2.00
ET711B	2.20	ET068	2.00	ET061	2.00
ET044	2.00	ET043	2.00	76M19	3.50
ET711R	2.50	ET7110	6.00	ET447	2.80
ET544	2.50	76PC9	4.40	76EX10	2.80
ET602	6.50	ET446	2.50	ET533A C	3.50
ET711A	7.50	ET543B	2.50	ET543A	2.50
ET445	2.50	ET241	2.80	ET780B	2.50
ET780A	3.00	ET541	2.50	ET444	3.00
76S7	2.50	76M17	2.80	76LM5	2.50
76SS6	3.00	76SW4	2.00	76R4	2.50
76M5	2.50	76VG5	5.00	76E04	3.00
76VG5	5.00	76M5	2.50	76R4	2.50

ALL SILICON 30/60w PA PORTAMP
6½"W x 8½"D x 3¼"H 12 — 16V, two inputs 5 & 100mV. 125, 250, 500 ohm output only. No. 763A **$70 ea.** 240V operation **$33 extra.** Freight collect.

COILS and IF's All **$2.50 ea** plus post 60c ¾"W x ¾"D x 2"H

MAIL cheque or money order (add postage) direct to —

RCS radio pty ltd
651 FOREST RD BEXLEY
NSW 2207 587 3491

New Products

Huntron "Tracker" for in-circuit troubleshooting

A product of the American company Huntron Instruments Inc, the Huntron Tracker has been designed to facilitate the assessment of components while still in circuit, thus minimising the need for time consuming — and sometimes destructive — desoldering.

The problem of isolating components, when troubleshooting, became obvious with the introduction of PC boards and has grown more urgent with their increasing complexity. There is a strong incentive, therefore, to assess components in situ, if at all feasible.

Unfortunately it isn't at all easy to do, particularly without a detailed knowledge of the module under test. If a capacitor or a device junction appears to be leaky, how can one be certain that the "leak" isn't a legitimate resistive path through a parallel chain of components? And so on.

There is also the ever-present danger that a test voltage which could be applied quite legitimately to a component in isolation, may damage a vulnerable device elsewhere on the board because of the still-intact wiring.

Faced with these problems, professional troubleshooters opt for a variety of approaches, depending on circumstances. They vary all the way from discreet probing with a multimeter to signal tracing by means of a logic probe or CRO. Whatever the method, deduction still plays a large role.

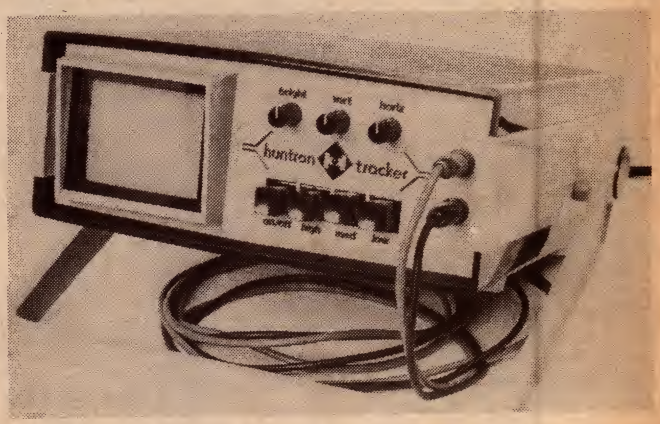
Against this background, the Huntron Tracker represents yet another approach which may have a strong appeal to some professional troubleshooters.

A small test voltage at mains frequency is present between the instrument's two needle-pointed probes, which can be applied to a particular component or between a suitable "common" line on a PC board and selected junction points in the circuitry.

The same voltage is used to deflect horizontally the spot on a 59mm x 44mm CRO tube. The amount of current which flows through the component or circuit under test is indicated by a proportional vertical deflection. The trace varies accordingly: straight lines, angles, curves, slopes, loops, etc.

The whole art in using the instrument is to learn to interpret this essentially x-y plot in purely comparative terms — the general nature of the path between the probe tips and the order of impedance.

If a diode is involved, or a transistor junction, there should be a sharp corner in the plot: for example, part of the trace horizontal and other part vertically up or down, depending on lead polarity. With a zener junction, there will be two sharp corners, with one end of the trace up and the other end down.



Supported by its adjustable bail, the Huntron tracker fits easily into a service situation. The distributors see a strong potential appeal to those servicing such items as electronic cash registers.

With external resistance in shunt or in series with a junction, a slope is evident on one or other part of the trace, but the corners are still evident, indicating that the junction(s) are intact.

On the other hand, a rounded "corner" or curved slopes indicate a suspect junction. No vertical deflection indicates an open circuit, while a simple vertical line indicates a short circuit.

Inductors and capacitors produce phase loops rather than straight lines and, when in shunt with device junctions, produce rather weird patterns, which the user will hopefully get to interpret, either on his own initiative or with the aid of the brochure supplied with the instrument.

As a protection for the equipment under test, the potential applied via the probes is limited both in terms of voltage and current. Three test conditions are provided, selectable by push buttons, which optimise the instrument to deal to best advantage with devices or circuits of nominally low, medium or high impedance. The literature suggests that the Tracker can be used freely with all likely circuitry, analog or digital, discrete or integrated, without danger of causing device failure.

Because of the need to interpret patterns, preferably in association with the relevant circuit diagram, the Huntron Tracker is not an instrument that would be suitable for a person with limited skill — at least for general troubleshooting.

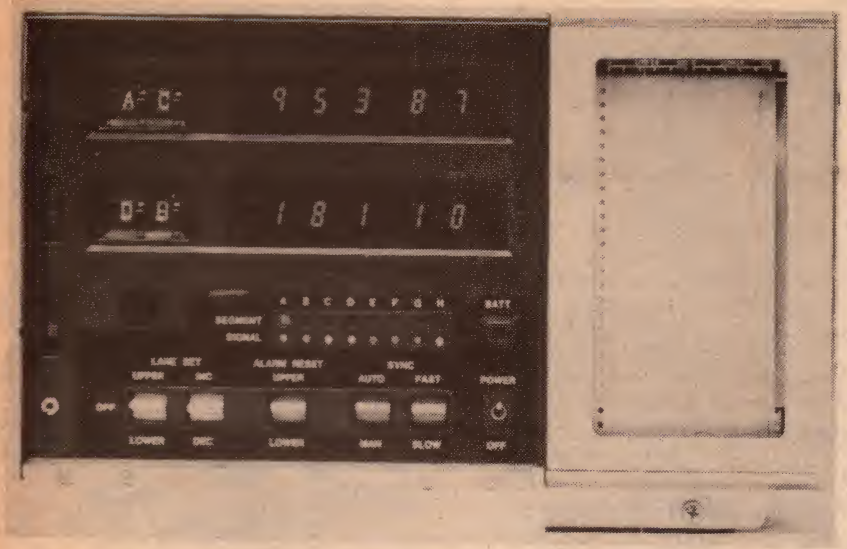
On the other hand, in situations where a good module is always available for comparison, or where evaluation for circuits or components can be reduced to a few guide diagrams, checking would be reduced to merely comparing patterns.

Physically, the Huntron Tracker is a quite compact unit, measuring 212mm wide x 87mm high x 285mm deep, plus support handle/bail. The finish is black and buff and the panel controls, other than the push-buttons already mentioned are for off-on, trace brightness, vertical centring and horizontal centring. The instrument is supplied complete with leads and microprobes.

The price quoted is $1367.35 including tax, or $1189 where sales tax need not be charged.

For further details: The Arlunya Division, Dindima Group Pty Ltd, PO Box 113, Balwyn, Vic 3103. Telephone (03) 836 6533. (W.N.W.)

Omega receiver from Japan



Japan Radio Company has expanded its respected range of professional VLF receivers with this high performance tracking receiver for Omega transmissions. Measuring only 290mm wide, including its inbuilt chart recorder, the model JLA102 can automatically track up to eight phase-coherent Omega stations. Should the S/N ratio of any station become unacceptable the operator is warned of a possible anomaly by an audible tone and visual station identification. For added convenience, automatic lane centreing is maintained. Segment synchronisation is automatic, although manual operation may be performed at the touch of a button.

Sensitivity of the JLA102 at 10.2kHz is .01uV, and it has a dynamic range of 90dB. The frequency reference operates at 4MHz and has a stability of two parts in 10^8 over the temperature range -10 to +50°C. Resolution is 1 CEL.

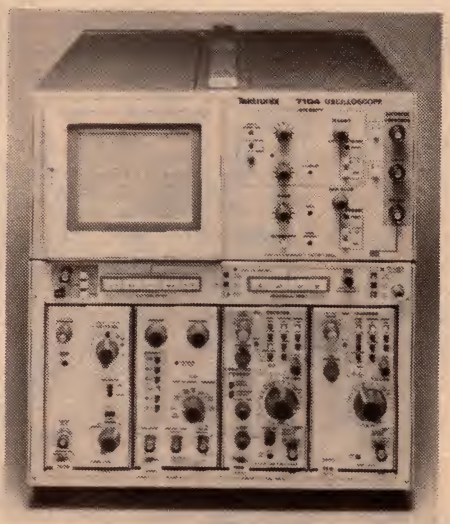
For further information contact the Professional Products Division of Vicom International Pty Ltd, 68 Eastern Road, South Melbourne 3205, Victoria. Telephone (03) 699 6700.

New scope has 1GHz bandwidth

New industry performance standards are claimed by Tektronix Inc for its latest oscilloscope, the model 7104, which has a full 1GHz bandwidth and calibrated sweep speeds to 200 picoseconds per division. At the same time the new instrument offers full compatibility with all standard 7000 series plug-ins in present use.

Incorporated in the model 7104 is a new CRT design featuring distributed horizontal deflection, a meshless scan expansion lens and a micro-channel plate electron multiplier. This gives a writing speed of 200mm per nanosecond, and a trace brightness approximately two orders of magnitude greater than previously available high-speed CRTs. Single events down to 20 picoseconds may be resolved directly on the screen, without photography.

The entire internal design of the 7104 uses microstripline techniques. Metallised elastomer interconnects are also used to lower reflection losses and mismatches. Risetime of the 7104 is less than 350 picoseconds, and horizontal bandwidth is from DC to 350MHz. Full sweep triggering capabilities extned to 1GHz.



Further information from Tektronix Australia, 80 Waterloo Rd, North Ryde, NSW 2113.

METAL CHASSIS

BOXES

CASES

PANELS

Big range of sizes in painted steel and aluminium

See June Issue Electronics Aust.

WARDROPE & CARROLL Eng. Pty Ltd

82 OAK ROAD,
KIRRAWEE, NSW 2232

Phone 521 5833

PO Box 330,
Caringbah, NSW 2229

LANTHUR ELECTRONICS

69 Buchanan Ave. or PO Box 162 North Balwyn, Vic. 3104. Phone: 859 4061.

ELECTRIC MOTOR SPEED CONTROLLER KITS

Controls down to stop without loss of torque. Consists of triac mounted on heat sink, diodes, resistor, pot & knob, 3 pin bass & plug and circuit. Use with hand tools, lathes, potters wheels, etc. Suitable for ac/dc brush type motors only. 10 amp 2400 watt capacity
Price including post, $10.95.

LAMP DIMMER KITS

Controls from full to out incandescent lamps up to 2400 watt. Consists of triac mounted on heat sink, diac, pot. & knob, resistors, caps, ferrite rod & wire, circuit. Use for spots, stage, projector etc. 10 amp. 2400 watt capacity Price including post, $8.95.
Rotary or slider control available. Please say which preferred.
Cabinets to suit above speed controller and lamp dimmer kits.

Plastic with alum. lid $1.95
All aluminium $2.95
NEON INDICATORS — 240 volt, red . 3 for $1.00

TUNING CONDENSERS
Roblan RMG — 1gang. 415pf. Suitable crystal sets etc.
Price including post $3.75

SLIDER SWITCHES
DPDT 3 for $1 10 for $3 post free.

SWITCHES — Toggle. DPDT 2 amp
250 volt $1.00
3 for $2.70

Sub-min. toggle. SPDT. 2 amp
250 volt $1.25
3 for $3.50

RESISTORS — Half watt. Pack of 50 (our selection) $1.00

BANANA PLUGS & SOCKETS —
4mm Red or black ..... Five pairs for $2.00

All above items — POST FREE.

MERLIN

WIRE WOUND RESISTORS
POWER RHEOSTATS
STAINLESS STEEL GRID RESISTORS

"SINGLE UNIT" ORDERS ACCEPTED — PROMPT DELIVERIES.
RESISTOR RANGE: 3-750 WATT.
VALUES: from 0.01 Ω
TOLERANCES: to 0.1% FIXED AND ADJUSTABLE
Specialized repetition windings.
RHEOSTATS: 20-400W in 5 body sizes.
Values 0.1 Ω — 100K Ω
Linear and tapered windings
GRID RESISTORS: High current, cast stainless steel grids for motor start, earthings, etc. "Load Bank" units designed to customer specifications.

Manufactured in Australia by —

HURTLE WEBSTER PTY LTD

11 Spray Ave, MORDIALLOC, VIC.
3195 Australia
Telephone (03) 90 4144 90 4344

Queensland:
Colourview Wholesale.
56 Raynham Street.
SALISBURY NORTH.
(07) 275 3188

South Australia:
Instant Component Service.
2/66 Humphires Tce.
KILKENNY
(08) 268 7088

Tasmania:
W & G. Genders Pty Ltd
All Branches.

Western Australia:
W. J. Moncrieff Pty Ltd.
176 Wittenoom Street.
EAST PERTH.
(09) 325 5722

New Zealand:
John Gilbert & Co. Ltd
16-22 Anzac Ave.
AUCKLAND 1. NZ.
Tel. 30839

New Products

Improved desoldering tools

The latest Royel desoldering tools incorporate two new developments to improve suction efficiency and solder disposal.

A special spring-loaded hollow tip and a "boost" vent in the periphery of the tool holder gives significantly improved suction. When the tip is first applied to the connection, its rear end closes off the side ports and exposes only the tip hole to the suction, so that molten solder is drawn in.

When all of the solder is inducted and the tip is lifted away from the termination, the spring moves the tip to expose the side ports, allowing an inrush of air which carries the solder back into the collection chamber. This is in fact a thin-walled removeable cartridge, which is easily withdrawn for cleaning or replacement.

Both the spring-loaded tip and the removeable collection cartridge are claimed to overcome major drawbacks of existing vacuum desoldering systems, and both are the subject of patents.

The Royel RE800-2 soldering/desoldering station shown features full feedback temperature control of both soldering and desoldering tools, with tip temperature variable over the range 200-400°C. It also features auxiliary grounding facilities.

For further information on the wide range of Royel soldering and desoldering equipment, contact Royston Electronics at 22 Firth Street, Doncaster, Victoria 3108.

C&K COMPONENTS

Consider the Advantages

C&K COMPONENTS

C&K Electronics (Aust.) Pty Limited
Office 2/6 McFarlane Street Merrylands NSW 2160
PO Box 101 Merrylands 2160 Telephone 682 3144 Telex AA23404
Agents Melb. 598 2333/Adel. 269 2544/Bris. 36 1277/Perth 458 7111

Obligation free and comprehensive data is yours for the asking

Wow & flutter meter

The Philips model PM6307 Wow and Flutter Meter is intended to allow service technicians to test and align audio/video tape recorders and gramophone turntables to performance limits previously measured only in laboratories. It consists of a high stability crystal-derived audio oscillator delivering either 3.15 or 3.00kHz, together with a measurement section and two analog meters showing drift and flutter, to 3%, each in three ranges.

The PM6307 can make measurements to DIN standard 45507, using either weighted or linear response.

Further information from the Test and Measuring Instruments division, Philips Industries Ltd — which has offices in most states.

Ultra pure oscillator

The Krohn-Hite model 4024A oscillator features distortion of less than .005% throughout the audio range. The tuning range, selected with three digit rotary switches is from .001Hz to 100kHz, with an accuracy of 0.5% and resetability of 0.1%. The main sinewave output is controlled by a four digit attenuator, with 1mV resolution up to 10V RMS.

The 4024A also provides a quadrature sinewave output and a square pulse output. It is designed specifically for applications requiring high precision, ultra low distortion and excellent frequency response.

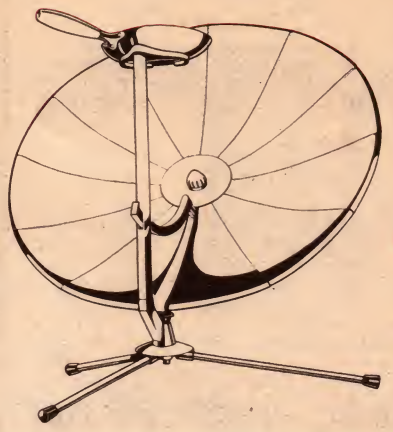
Further information is available from Krohn-Hite distributors Warburton Franki Pty Ltd, with offices in most states.

Portable solar cooker

A lightweight, portable solar cooker which can be erected in minutes is now available from Dick Smith Electronics. Constructed entirely from aluminium and durable plastic materials, it is designed for years of trouble-free service yet has a mass of only five kilograms — less than a typical gas burner and bottle.

DSE claims that the Sun-Gril operates well even in cloudy conditions and that in normal clear conditions it has a heating capability approximately equivalent to that of an 800-watt electric hotplate. It will apparently boil a litre of cold water in nine minutes.

Priced at $95.00, the Sun-Gril is available from all Dick Smith stores.

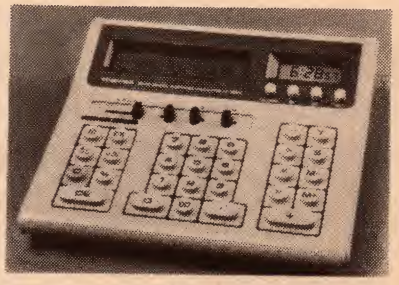


Instrument cases

Australian Transistor Company has increased its well-known range of instrument cases, and also introduced a simpler two-figure identifying system. Each case style is now indentified by an alphabetic letter, which is accompanied by a numeral to specify the size. The vinyl top/sided instrument cases are now style A, the similar amplifier cases style B, diecast cases style C and grey plastic/aluminium case style D.

A free brochure is available from many parts stockists, or from Australian Transistor Company, 726 High St, East Kew, Victoria 3102.

Clock calculator



This new Toshiba desk calculator (model LC-1290C) features inbuilt quartz digital clock and high-contrast LC displays.

free POWER TRANSISTOR 2N3055 with every $10 purchase

used in power supplies, audio amplifiers, train controllers

clip this ad. MAIL OR BRING TO NEWCASTLE

Dealers for the products of Dick Smith Electronics --- 691222

ELECTRON 2000

WE SUPPLY THE DICK SMITH PRODUCTS ADVERTISED IN THIS MAGAZINE • 44 Brown Rd. Broadmeadow, 2292

NEW BOOKS

Just a few of the thousands in stock. Call in or write. Prices subject to fluctuation. Correct at time of going to press.

American Radio Relay League

NEW 1979 EDIT. NOW OUT $13.95

AARL Antenna Handbook $8.00
Solid State Design for the Radio Amateur $12.80
Coil Winding Calculator: L/C/F Calculator $4.45

Radio Society Great Britain

Amateur Radio Techniques, Hawker $9.35
Radio Communication Handbook Vol. 1 ..... $21.85
Radio Communication Handbook Vol. 2 ..... $18.90
Test Equipment for the Radio Amateur — new 2nd edition 1978 ..... $11.75

Recent Popular Titles

WORLD RADIO TV HANDBOOK
1979 edition. Guide to the World's broadcasting and TV stations. NOW OUT $15.95

Amateur Radio Theory Course — Ameco $7.80
6800 Assembly Language Programming $12.55
Beam Antenna Handbook, Orr $7.00
Be Your Own Television Repairman $2.95
Best of Creative Computing, Vol. 1 ..... $12.75
Best of Creative Computing, Vol. 2 ..... $12.75
Best of Byte Vol. 1 ..... $15.95
CMOS Cookbook, Lancaster $14.25
Cubical Quad Antennas, Orr $6.75
Ham & CB Antenna Dimension Charts, Noll $3.90
Introduction to Microcomputers, Osborne
Vol. 0 — Beginners Book $12.55
Vol. 1 — Basic Concepts $12.55
Vol. 2 Some Real Microprocessors) New Edition
Loose-leaf w/out Binder $19.00
With Binder $28.00
Vol. 3 Some Real Support Devices — New Edition
Loose-leaf w/out Binder $19.00
With Binder $28.00
Learning Basic Fast, Claude J. DeRossi $11.95
Microprocessor Interfacing Techniques, Lesea & Zaks $16.40
Microprocessors from Chips to Systems, Zaks $16.40
Microcompute Primer, Sams $10.75
Personal Computing A Beginners Guide, Bunnell $12.70
Radio Amateur Antenna Handbook, Orr & Cowan $9.90
Radio Handbook, Orr, New 20th edition $26.50
Scelbi Byte Primer, Wadsworth & Helmers $16.80
Servicing Electronic Organs — Tab $13.95
Simple Low-Cost Wire Antennas For Radio Amateurs, Orr $7.00
Truth About CB Antennas, Orr & Cowan $8.50
Transistor Substitution Handbook, 17th Ed. $7.95
TTL Cookbook, Lancaster $12.70
VHF Handbook for Radio Amateurs, Brier & Orr $8.50
World DX Guide — Companion to World Radio TV Handbook $9.95
73 Dipole & Long-wire Antennas, Noll $6.75
73 Vertical Beam & Triangle Antennas, Noll $7.50

MAIL ORDERS BY RETURN

PLEASE ADD 90c per parcel postage (Vic.)
$1.70 per parcel interstate

TECHNICAL BOOK & MAGAZINE CO.
295-299 Swanston St.,
MELBOURNE 3000
Ph. 663 3951

Books & Literature

Telecommunications

TELECOMMUNICATIONS: a History, by Egon Larsen. Frederick Muller Ltd, London, 1977. Hard covers, 153 x 228mm, 86pp, with illustrations. Price $8.25.

As its title suggests, this is a history of telecommunications. It appears to be written primarily for the younger reader, particularly the school student seeking a reference work for a project assignment. However it is presented in an easy-to-read and informative fashion, and would thus seem also quite well suited for the general reader.

The author is an established writer of books for younger readers, particularly on technical and scientific topics. He progresses here from early methods of communication such as writing and smoke signals through printing and the electronic telegraph and the telephone to radio, television, space communications and the future. All in a smooth and logical fashion.

There are not too many illustrations in the bulk of the text, but those that are given are clearly drawn. Some 14 half-tone black and white plates are also given in the centre of the book.

Even though the material was familiar, I found it made interesting reading. In short, then, a book I can recommend.

The review copy came from the ANZ Book Company Pty Ltd, of 23 Cross St, Brookvale, NSW 2100. (J.R.)

World radio & TV

1979 WORLD RADIO AND TELEVISION HANDBOOK, 33rd Edition. Edited by Jens Frost and published by World Radio and Television Handbook Co, Copenhagen, Denmark.

The 1979 edition of the World Radio and Television Handbook was released in mid-January, a month earlier than usual, in order to satisfy the demands of many listeners who wanted an accurate list of the new medium-wave plan. Last November 23, stations in Europe, Africa, Asia and the Pacific moved to the new 9kHz separation on medium-wave, rendering previous Handbook editions out of date.

The 1979 edition covers 544 pages and has an anticipated circulation of 55,000. It follows the usual format of complete details of all the world's radio stations by country and continental grouping, while the same system is adopted for television. A complete list by frequency of the medium and shortwave stations of the world are at the back of the book.

Articles on the hobby of radio listening are also included, and one written by Chris Martin of Sydney covers the medium-wave listening he has enjoyed at special listening posts in Australia and New Zealand. Reg Kennedy, well-known as producer of BBC World Radio Club, has an excellent article on gospel radio stations, while others cover high frequency reception by George Jacobs VOA, solar activity in 1979, and many others written to help the radio listener.

The Handbook is as comprehensive as ever, and maintains its high standard of accuracy in its information with a complete coverage of long, medium and shortwave stations.

The Handbook should be available through bookstores in Australia this month, but readers can obtain a brochure and other details from the sole New Zealand agent; Arthur Cushen, 212 Earn Street, Invercargill, New Zealand.(ATC)

AM/FM radio

RADIO STATIONS GUIDE, by B. B. Babani and M. Jay. Bernard Babani Publishing Ltd, London, 1978. Soft covers, 108 x 180mm, 125pp. Price in UK £1.45.

This is a completely updated and revised version of an earlier book written by the late B. B. Babani. The current book has been prepared by "Maurice Jay", which is apparently a pseudonym used by a well-known British technical author.

It lists long and medium wave AM radio stations in Europe, European VHF/FM, broadcast radio stations in the USA and Canada, international short wave broadcasting stations, and local radio stations in the UK. As such it would be a little restricted in its value for the Australian reader, but on the other hand its cost is very modest.

In most cases the stations are listed in ascending frequency order. Each station is described in terms of its site, country, ERP and call sign if any.

Considering its low price, a book which may well be of considerable interest and value to short wave and broadcast-band DX enthusiasts.

The review copy came direct from the publisher. (J.R.)

INFORMATION CENTRE

MUSICOLOUR III: As I am about to build another Musicolour III and am safety-conscious enough to be acutely aware of the inherent danger of "230V heatsinks", I would question whether any significant advantages accrue from linking the heatsinks electrically to the circuit. The alternative "isolated stud" Triacs such as the SC260D2 or a lighter plastic encapsulated type appear to me to provide a marked increase in safety as the heatsink can be left floating or earthed. Do you agree that the alternative is workable? (A.M., Paremata, N.Z.)

● There is no reason why the new isolated case Triacs cannot be used. However, we would hope that even with these fitted, constructors would still be "scared" of the circuit and therefore exercise utmost care.

CDI: I have fitted the CDI unit described in July 1975 to my Datsun 180B. However, with it connected, the air-conditioner will not work as this has a connection to the negative terminal of the coil. I gather this is to cut off the air-conditioning below 800 rpm. Are there any modifications to the CDI which will solve this problem? (K.R., Padstow, NSW).

● You could try connecting the ignition monitoring wire from the air-conditioner to the points. This will provide impulses to the airconditioning circuitry but the amplitude may not be sufficient for reliable operation. In that case, you will have to contact the manufacturer for advice.

PLAYMASTER 132: I am using a PYE CD3 tape deck and an adaption of the Playmaster 132 stereo amplifier. When recording from the phono input using ALC, the tape is all distorted. A friend of mine has the same deck and an "EA" amplifier and has the same problem. I also have trouble when the Bass and Treble are turned up, the speakers "motor-boat". Also I seem to have a lot of power hum in the amplifier. (N.A., Camperdown, Vic).

● The problem with the tape deck appears to be overloading. You should examine the specifications of the deck and determine the maximum input voltage. With this information you can make up a voltage divider across the recording outputs of the amplifier.

The other problems with the amplifier should be cured by implementing the suggestions in our article "Playmaster 132 reconsidered" published in May 1974. (File No 1/SA/48).

Notes & Errata

NRZ RECORDING (April 1977, File No. 8/M/11): The hex inverter device required for the circuit is a 7406, not a 7407 as specified.

SOLAR PANEL OFFER (January/March 1979): Due to the imposition of import duty, the price of the 14.4V/4.32W panel offered must now be increased to $182 including sales tax, or $160 tax exempt. In either case the figure of $5 still applies to cover certified postage and handling. The address of Amtex Electronics is Suite 503D, 73 Archer Street, Chatswood, NSW 2067, telephone (02) 411 1323.

INTERSIL ICL7106 DVM KIT (February 1979, File No. 7/M/56): We have been asked to advise readers that the sole representatives for Intersil products in Australia are R & D Electronics of 23 Burwood Road, Burwood, Victoria 3125.

BIPOLAR TRAIN CONTROLLER (February 1979, File No. 2/MC/17): In the wiring diagram at the bottom of page 35, the output connections of the rectifier bridge are shown transposed. The positive output should connect to the 1k pot and the collector of the BD263, not the negative output. The circuit diagram is correct.

AMATEUR RADIO BOOKS (Reviewed in February 1979, page 115): Both of the books mentioned are available from WIA (NSW) Education Services, PO Box 109, Toongabbie, NSW 2146. Both books may also be obtained as part of a more extensive Novice kit, available for $15.00 posted.

If you are unable to complete an "Electronics Australia" project because you missed out on your regular issue, we can usually provide emergency assistance on the following basis:

PHOTOSTAT COPIES: $2 per project, or $2 per part where a project spreads over multiple issues. Requests can be handled more speedily if projects are positively identified, and if not accompanied by technical queries.

METALWORK DYELINES: Available for most projects at $2 each, showing dimensions, holes, cutouts, etc., but no wiring details.

PRINTED BOARD PATTERNS: Dyeline transparencies, actual size but of limited contrast: $2. Specify positive or negative. We do not sell PC boards.

PROJECT QUERIES: Members of our technical staff are NOT available to discuss individual projects, either in person at our office or by telephone.

REPLIES BY POST: Limited to advice concerning projects published within the past two years. Charge $2. We cannot provide lengthy answers, undertake special research or discuss design changes.

BACK NUMBERS: Available only until our stocks are exhausted. Within three months of publication, face value. Four months and older, if available, $2. Post and packing 60c per issue extra.

OTHER QUERIES: Technical queries outside the scope of "Replies by Post" may be submitted without fee, for reply in the magazine, at the discretion of the Editor.

COMMERCIAL, SURPLUS EQUIPMENT: No information can be supplied.

COMPONENTS: We do not deal in electronic components. Prices, specifications, etc., should be sought from advertisers or agents.

REMITTANCES: Must be negotiable in Australia and made payable to "Electronics Australia". Where the exact charge may be in doubt, we recommend submitting an open cheque endorsed with a suitable limitation.

ADDRESS: All requests to the Assistant Editor, "Electronics Australia", Box 163, Beaconsfield, 2014.

PROJECTS & CIRCUITS NO. 2

You can't afford to miss out on this exciting new book from "Electronics Australia". Here are just a few of the projects it contains: remote TV headphones, multi-band vertical aerial, roulette wheel, radar burglar alarm, model train control, voice-operated relay, transistor tester, water level alarm . . . plus many more. Get your copy now!

Available from "Electronics Australia", 57 Regent St, Sydney. **PRICE $3.00** OR by mail order from "Electronics Australia", PO Box 163, Beaconsfield, 2014. **PRICE $3.60.**

ELECTROCRAFT MANUFACTURING PTY LTD

DISTRIBUTION AMPLIFIERS FOR FM & TELEVISION

THE WIDEST CHOICE IN WIDEBANK AMPLIFIERS 40-860MHz

Fully designed and manufactured in Australia by "ELECTROCRAFT", with a background experience of over 14,000 MATV systems.

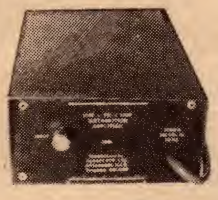
A range of Medium and High gain RF DISTRIBUTION amplifiers, suitable for all TV and FM Radio transmission within the VHF and UHF Bands I to V.

At present there are 8 amplifiers in our range, with greater output models to follow. Most models require very low input and have good signal-to-noise ratio, as such this makes them very suitable for weak signal areas.

A high brightness red panel light with solid state reliability on all models.

Model 40-100WN has been designed for Wollongong and Newcastle, the local channels (4 and 5A Wollongong) (3 and 5A Newcastle) are attentuated by 24dB allowing the distant Sydney channels to be amplified without the problems of cross modulations from the local channels.

The two models 40-100HL — 40-500HL are provided with gain controls, which are independent of each other in their operation, each control has a variable attenuation of 20dB. The case is steel, covered in black vinyl finish, dimensions are 23 x 14 x 8cm.



68 WHITING STREET,
ARTARMON,
NSW 2064, AUSTRALIA
Telephone 438 3266, 438 4308

Marketplace

FOR SALE

EA-'48-'78 80c each. L. Hansen, 96 Prince Edward Ave, Earlwood 2206, (02) 55 3820.

FREE OFFER ... ORDER OVER $10 ... FREE 10 OF BC204 (BC177) 10% discount for orders over $20,. ORDER NOW!
INCREDIBLE PRICES for new prime spec components. Satisfaction guaranteed or money back. Ideal for hobbyists, schools, radio clubs, servicemen, etc. BC209 — 10 for $1.50, BC209C — 10 to $3, BC204 (BC177, BC557) 10 for $1.40, BC206 (BC179, BC559) 10 for $1.40. FREE OFFER + DISCOUNT OF 10% FOR THIS MONTH ONLY! CMOS ICs — 4006 — $1.30, 4013 — 60c, 4017 — $1.30, 4018 — $1.30, 4024 — 90c, 4026 — $2.30, 4027 — 90c, 4029 — $2, 4035 — $1.40, 4047 — $1.50, 4049 — $1.00, 4055 — $2.50, MORE BARGAINS IN4007 (EM410) — 10 for $1.50, 2N2291A — 50c, 2N3563 — 50c, 2N 3566 — 30c, 2N3638 — 45c, 2N 3639 — 45c, 2N 3646 — 45c, BD438 (BD188) — $1. MAD PRICE ON TOP QUALITY AUDIO ICs. HURRY STOCKS ARE LIMITED! TAA611B — 4 W peak, 12V SUPPLY, 8 ohm load, $1.50 ea or 4 for $5.50 (incl. 1ct diagram). TBA810A — Powerful 13W Peak Audio IC 16v supply, 4Ohm load, $3.50 each or 4 for $12.95 (incl cct diagram). TBA 651 — Tuner & I.F. AMP IC (Mixer, oscillator, IF AMP, AGC Control all in one IC). Supply 4.5v to 18v incl cct diagrams $2.50 each or four for $8.95. POST AND PACK 60c. MICRONICS, PO BOX 175, RANDWICK 2031.

SPEAKER BOXES. Hand-made. Excellent acoustically. Write: SHERWOOD ELECTRONICS, PO Sherbrooke 3789.

THE "ELECTRONICS AUSTRALIA"
LOG BOOK
FOR: RADIO AMATEURS
DX LISTENERS
CB OPERATORS **$2.95**
From "Electronics Australia", 57-59 Regent St, Sydney OR by mail order from PO Box 163, Beaconsfield 2014. Price includes postage.

TIME CLOCKS

SANGAMO **$16.00** DAY OMIT DEVICE
HORSTMANN **$12** TYPE "K"
SANGAMO **$13.50** LESS DAY OMIT DEVICE
240V 50 cs 15A Contacts
Used tested and guaranteed
PACK & POST N.S.W. $2.00
Vic. & Qld., S.A. $2.90, W.A. $3.40
CLOCK DISPOSAL CO.
P.O. Box 147
LINDFIELD, N.S.W. 2070

AM/FM SIGNAL GENERATOR. Philips PM 5324. 100 KHz-110MHz in 9 ranges. Bandspread and variable wobulator on 3 ranges 75-110MHz and AM-IF and FM-IF. AM or FM modulation int or ext. Variable attenuator. Crystal calibration. $730 o.n.o. Phone (07) 375 5075 A.H.

NEUMANN D.S.T. MC Cartridge, new Weinz stylus by Garrott Bros. ½in mount. $185. Ph (03) 95 0179.

AUSTRALIAN RADIO DX CLUB — Published over 360 pages of DX notes during 1978. The official news source for Radio Australia's DX Programme for over 14 years. 1979 is World DX Youth Year with special introductory membership fee for people under 18 years old. For full details write to PO Box 67 Highett, Victoria 3190, or PO Box 79 Narrabeen, NSW, enclosing a 20c stamp.

RESISTOR & CAPACITOR BARGAINS ½ & 1 watt. All values. 2 cents ea. 5 watt 20c ea. 10 watt 40c ea. 20 watt $1 ea. Poly Capacitors to .082 20c ea. .1uf and up 60c ea. 20% Discount on lots of 100. P&P $1. HUNT ELECTRONICS, 600 Old Cleveland Rd, Camp Hill 4152, BRISBANE (07) 398 6433.

WANTED

SUPER 12 WHARFEDALES, Goodmans or other similar quality speakers for cash. Ph (03) 95 0179.

READER SERVICE

SERVICE to most brands, JAPANESE, Cassette recorders, car cassettes, Tape Decks, radios, etc, incl. National & JVC. We also repair Electronic digial clock radios, Video Games, both B&W, colour. PETER G. BROUGHTON, 99 Sussex St (nr King Street). Sydney. Ph: (02) 29 3845.

INTEL 2758 eproms. 1k x 8, 5 volt, $35 ea.

INTEL 5101L-3 CMOS Rams 256 x 4, $7.50 ea. Limited stock only.

G. S. & Assoc, East St Kilda, Vic.
Ph (03) 527 6895.

DISPLAY ADVERTISEMENTS IN MARKETPLACE are available in sizes from a minimum of 2cm x 1 col rated at $11 per col cm.
CLASSIFIED RATES $2 per line per insertion payable in advance. Minimum two lines.
CLOSING DATE is six weeks prior to the on-sale date. Issues are on sale the first Monday of each month.
ADDRESS all classified orders, copy, enquiries, etc., to: The Advertising Manager, ELECTRONICS Australia, Box 162, Beaconsfield 2014.

A.C.E. RADIO ELECTRONICS CENTRE

136 VICTORIA RD, MARRICKVILLE, NSW 2204 TELEX AA 26874 PHONE 51-3845

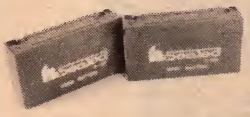
RANK ARENA 2-WAY SPEAKER SYSTEM

LESS THAN ½ PRICE

8 OHMS 10 watts teak cabinets 18¼" H 11"W 9½"D
Pack & Post NSW **$2.00** VIC QLD **$3.50**
SA TAS WA NT **$5.50**

$42.00 PAIR

GEL-CELL RECHARGEABLE BATTERIES



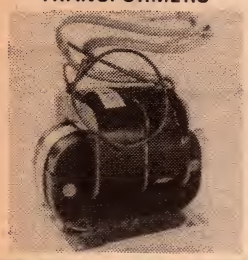
6 VOLT 1.2AH **$4.95** EA PP NSW 80c INTERSTATE $1.20

ALSO

12V 1.2AH (Two 6V batteries supplied) complete with 240V plug-pak charger. **$10.95** PP NSW $1.75 INTERSTATE $2.50

Batteries are in fully sealed high impact, moulded case 3" x ⅞" x 2".

C-CORE TRANSFORMERS



LOW NOISE. HI EFFICIENCY

PRIMARY 240V 50Hz	
MODEL JT266 0-18V 8A	**$22.95**
MODEL JT235 26.0-26V4A	**$21.95**
MODEL JT248, 10V, 10A	**$22.95**
MODEL JT249 0-15V 8.5-0-8 5V 4A FOR MICRO PROCESSOR	**$23.95**
MODEL JT274 10V 10A 2 x 12V 1A	**$22.95**
MODEL JT 253A 0-18V 30A PEAK	**$41.95**

P.P. MODEL 253A NSW **$3.50** V.Q.T. **$5.50** SA WA NT **$7.00**
P.P. ALL OTHER MODELS NSW **$2.95** V.Q.T. **$3.75** WA SA NT **$5.50**

POWER TRANSFORMER SALE

All new with 240V 50Hz Primary.

1. 0.12V ½ amp	**$2.50**
2. 0.24V ½ amp	**$2.50**
3. PF201, 225V CT 50MA 6.3V 2A	**$4.50**
4. A&R 6232 70V CT .75A	**$6.50**
5. PF 3162 2 separate 20V 1.5A	**$6.50**
6. 12-0-12V ½A	**$2.90**
7. 0-240V 60MA	**$4.50**
PP 1-7 NSW 75c Interstate	**$1.20**
8. Type JT251 40V CT 2A	**$10.95**
9. Type JT256 50V CT 2A	**$10.95**
10. Type JT144 56 V CT 2A	**$13.95**
11. 385V CT 60MA, 6.3V 3A, 5V, 2A	**$7.50**
12. 55V-0-55V 2A	**$7.50**
13. 20, 30, 40V-0-20, 30, 40V 2A	**$8.50**
14. 115-0-115V, 300MA 15-0-15V 400MA 6.3V 4A C-CORE	**$8.50**
15. 0150v, 300MA 6.3V 8A C-CORE	**$8.50**
PP 8 to 15 NSW	**$2.00**
Interstate	**$3.50**

SPEAKER TRANSFORMERS

5K to 15 OHMS 5W **75c** pp 50c
pp 50c
BIG RANGE OF IMPS AVAILABLE

EX-PMG

Ring, tip and sleeve ¼" jack plugs with cord, red and grey. Ideal for patch leads.
10 for **$3.95** pp $1.00

LAST OFFER ● NEW VALVES ● TO CLEAR

25 MIXED TYPES FOR $15.50 PP NSW **$3.50** Insterstate **$5.50**

NB: The maximum number of any one type valve supplied with this offer is 3.

1BK2	6AQ8	6BQ7	6CU5	6ES6	6S2	9AK8	12BZ7	50C5
1T4	6AB8	6BW7	6CQ6	6EM7	6S4A	9AQ8	12BQ6	50EH5
1G3GT	6AG5	6BN4A	6CB6	6FQ5	6SA7	9U8	12K5	50 BM8
1B3GT	6AS6	6BC8	6CD6	6F5	6T8A	9D6	12x4	OZ4
1AJ4	6AS8	6BY7	6CB5	6FC7	6V9	11LY6	12AE6	45A5
3A4	6AR5	6BW4	6CU8	6GM6	6W2	12AX4	12AC6	UF41
3C4	6AU6	6BJ6	6CX8	6EW6	6W6GT	12AV7	15A6	UBC41
3Q5GT	6AQ7GT	6BM8	6CV7	6GJ7	6x2	12AT6	15CW5	UY85
4GK5	6AH4GT	6BK7	6CQ8	6J6	7AN7	12AD6	16A5	UCL83
5Y3GT	6BH8	6CG8A	6DT6	6JN8	7GS7	12BA6	16AB8	UCL82
5U4GB	6BN8	6C4	6DR8	6K7G	7N7	12BE6	17Z3	AZ41
6AV6	6BA7	6CW7	6D58	6K6GT	7R7	12BH7	21A6	5R4WGY
6AM8A	6BA8	6CM7	6DC8	6SS7	7V7	12BL6	35A5	75B1
6AL5	6BD7	6CM6	6ET6	6SK7	9A8	12BV7	32A8	DM160

Please indicate a substitute should any of your slection be out of stock.

GARRARD MODEL 6-200 CP STEREO RECORD PLAYER

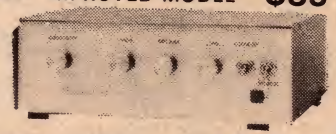
$27.50

½ PRICE

240V 50Hz ● 3 speeds ● 7", 10" or 12" records ● auto/manual operation ● cue-pause device ● reject/restart facility ● auto switch-off ● 10½" platter, rubber mat ● ceramic cartridge.
PP NSW **$2.70** V.Q.SA. **$3.70**. NT WAT **$4.70**.
Base and cover $35.00.

MUSICOLOUR — NEW IMPROVED MODEL $85

For the disco, light show, party nights or just relaxing . . . enjoy your records and tapes more. Simple to connect to the home stereo or PA system, 3 channels, 1500 watts max. load each. operate 240V AC.

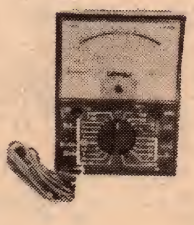


EACH CHANNEL FULLY PROTECTED

P.P. $3.50 Interstate $5.50.

● HIOKI MULTITESTERS ●

PROFESSIONAL QUALITY



MODEL 3005. Taut Band, Relay Protected. Mirror Scale. 50 KOPV.
AC VOLTS 10-50-250-1000
DC VOLTS 0-.5, 1, 2.5, 10, 50, 250, 1000.
DC AMPS. 50uA — 2.5, 5, 50, 500 MA, 10A.
AC AMPS 10A.
OHMS, 2K, 20K, 200K, 2MEG.
Low Freq. Output. —20, +36dB. **$69.95**

MODEL 3001: 2K OPV fuse, diode protected.
DC VOLTS: 0.5, 2.5, 10, 50, 250, 1000.
AC VOLTS: 10, 50, 250, 1000.
DC AMPS: 0.5, 10, 250MA.
OHMS: 3K, 300K, 300K. **$29.95**

MODEL 3002: 20K OPV, taut band, fuse, diode protected, Mirror scale.
DC VOLTS: 0.5, 2.5, 10, 50, 250, 1000.
AC VOLTS: 10, 50, 250, 500, 1000.
DC AMPS: 50uA, 25, 250MA.
OHMS: 10k, 100k, 1MEG.
Low freq. ouput: —20, +36dB **$41.95**

MODEL 3003. 30k OPV taut band, fuse, diode protected, mirror scale.
DC VOLTS: 0.25, 2.5, 10, 50, 250, 1000.
AC VOLTS: 10, 50, 250, 1000.
DC AMPS 50uA, 2.5, 25, 250MA, 10A.
AC AMPS: 10A.
OHMS: 5K, 50K, 500K, 5MEG.
OUTPUT: —20, +36dB. **$52.95**

Model 3010: 100K, OPV, taut band, relay protected, mirror scale.
DC volts: 0.1, 1, 2, 5, 10, 50, 250, 500, 1000.
AC VOLTS: 10.50, 250, 500, 1000.
DC AMPS: 10uA, 100uA, 1, 10, 100, 500MA, 10A.
AC AMPS: 10A.
OHMS: 2K, 200K, 2MEG, 20MEG.
OUTPUT: —20, +36dB. **$75.50**

All models supplied with batteries. Probes. Instructions. Send SAE for further details.
Add $1.50. PP NSW. $2.50 Interstate.

EXTRA SPECIAL

TAG TANTALUM CAPACITORS 2 PACKS TO PICK FROM

PACK No 1.: .1, .22, .47, 1, 1.5, 2.2, 3.3, 4.7, 6.8, 35V. 10, 22, 25V. 47/16V. 100/6.3.
50 MIXED **$8.95** PP 50c.

PACK No. 2: .33, .68, 35V. 3.3, 4.7, 10, 15, 22, 16V. 6.8, 25V. 68/10V.
50 MIXED **$7.95** PP 50c

RECORD PLAYER PLINTH

NEW FACTORY SECONDS.
18" x 15" x 3¾" teak, or walnut wood veneer. Cut-out to suit various models — easy to insert blank board to suit your own model.
$5.50 PP NSW **$1.50** INTERSTATE **$2.50**

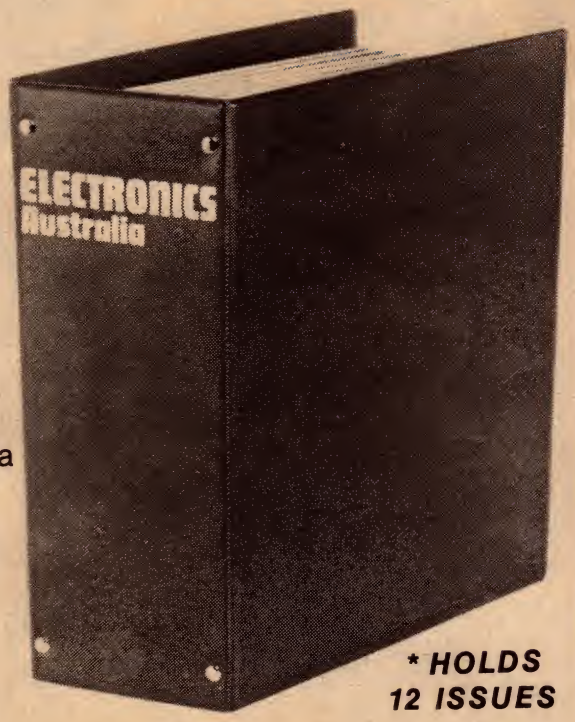
SERVICE

Moderate charges — Repairs guaranteed. Radios, Tape Recorders, Cassettes. Amps.

WE REGRET THAT PRICES ARE SUBJECT TO CHANGE WITHOUT NOTICE

Don't let your valuable issues go astray

ELECTRONICS AUSTRALIA BINDERS



These attractive binders finished in brown plastic with gold lettering will keep your back issues of Electronics Australia neat and tidy.

***HOLDS 12 ISSUES**

Available from
Electronics Australia,
57 Regent St, Sydney. PRICE: **$4.50**
or by mail order from Electronics Australia, P.O. Box 163, Beaconsfield 2014.
PRICE **$5.50** NSW: **$6.50** other states;
or 6 for: **$28.00** NSW; **$30** other states.

*Magazines prior to April 1971 will need to be trimmed to fit binder

SUBSCRIPTION SERVICE

ELECTRONICS Australia

Subscription Rates
$18.00 per year within Australia.
$A21.00 per year elsewhere.

Make sure you receive every copy of the magazine by ordering it from your newsagent or the publisher. For publisher subscriptions post this coupon, with your remittance, to Electronics Australia Subscription Dept., John Fairfax & Sons Ltd, GPO Box 506, Sydney 2001. Subscription will start with first available issue.

Name . . . . . .

Address . . . . . .

Postcode . . . . . **Enclosed is** . . . . . **for** . . . . . **years**

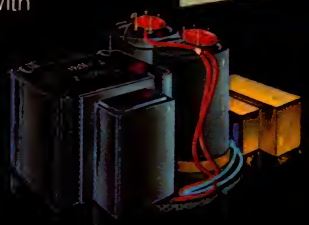
ADVERTISING INDEX

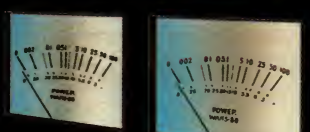
THE JVC SEPARATES.

Sensitive tuners, plus DC amplifiers that help eliminate sonic backlash.

If you've ever listened to a JVC music system with a separate tuner and amplifier, and thought, "One of these days..."

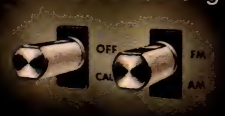
Well that day is here. The new JA-S44 DC integrated stereo amplifier, with its exclusive built-in SEA graphic equalizer and dual power meters, provides clean, uncannily-accurate music reproduction, with all the power you're ever likely to need.*





Our "Tri-DC" design in the JVC JA-S55 and JA-S77 further eliminates distortion-causing capacitors within the DC phono equalizer, DC tone control and DC power amplifier sections, providing frequency response from 5Hz to 100kHz (+0, −1.0dB). And they have dual power supplies—not one for each channel, as in conventional designs—but one for the Class A-operated preamp/tone control section, and a second which performs even heavier duty for the Class B-operated DC power amplifier section. This unique design practically eliminates both inter- and intra-channel crosstalk and distortion, or what we call "sonic backlash." The results: increased tonal definition and brilliance, especially with high-level transient signals.

The new JVC JT-V22 AM/FM stereo tuner is a standout in its class. With an FM front end that uses an FET RF amplifier, combined with a 3-gang tuning capacitor, the JT-V22 brings in the most timid FM stations and makes them sound as though they're just around the corner.



Or, if you're in an area where FM stations are a hairline away from each other on the dial, it delivers clear, interference-free reception. Then, to help you make sure you're on target, it has both signal strength and center-channel tuning meters.

Probably the most significant advance in recent FM tuner technology is JVC's Phase Tracking Loop circuitry in our new top model—JT-V77. This advanced circuit provides high signal-to-noise ratio as well as excellent interference rejection and freedom from multipath effects and adjacent channel interference. It's still another example of JVC's innovative engineering. But sounds speak louder than words. See and hear these magnificently-designed separates at your JVC dealer soon.

For details on all JVC Hi-Fi Equipment, write to JVC Advisory Service, P.O. Box 307, North Ryde, New South Wales 2113.

Top JA-S22 Bottom JA-S55 Top JT-V77 Bottom JA-S77

For pure Hi-Fi entertainment!

JVC
the right choice

Top JT-V22
Bottom JA-S44

*45 watts/channel, min. RMS, 8 ohms, from 20Hz-20kHz. with no more than 0.02% THD.

WT93/78

Pro. Series

Technics DC 'Flat Series'. Components literally made for each other.

In creating the 'flat' system, Technics engineers separated the basic amplifier / tuner into five components, researched and developed each, then recombined them into a system of audio excellence.

The system consists of:

Stereo Tuner (ST-9030) with wide and narrow IF bands.

Stereo DC Preamp. (SU-9070) with phono signal-to-noise ratio of 88dB (for 2.5 mV input).

Stereo Universal Frequency Equaliser (SH-9010) for exact response control in any acoustic environment.

Peak/ Average Meter Unit (SH-9020) for exact response measurement.

Stereo/ Mono DC Power Amplifier (SE-9060) with all-stage direct-coupled pure complementary symmetry circuitry. Total harmonic distortion is 0.02%.

Each individual component offers a degree of fidelity in sound reproduction, and a flexibility and ease of operation that makes it a natural choice for the audio fan who cannot be content with less than the best.

National Technics hi-fi

T78.16

For a National Technics Catalogue, please write to:
National Technics Advisory Service, P.O. Box 49, Kensington, N.S.W. 2033.